

**Shire of Murray Town Planning Scheme No 4
Amendment No 104 (Point Grey)**

Shire of Murray

**Report and recommendations
of the Environmental Protection Authority**

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Summary and recommendations

This report is to provide the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment, about Shire of Murray Town Planning Scheme (TPS) No. 4 Amendment No. 104. This amendment to the Shire of Murray TPS proposes to rezone Lots 75, 137-139, 293, 299, 322, 672, 727, 729, 738, 1132, 1133 & 1145 at Point Grey from 'Rural' to 'Special Development'.

Relevant Environmental Factors

In the EPA's opinion, the following environmental factors have been identified from the discussion of components of the amendment as being relevant to the scheme amendment:

- a) Vegetation - significance of remnant vegetation
- b) Declared Rare and Priority Flora;
- c) Fauna - impact of proposed development on waterbirds;
- d) Wetlands - impact of proposed development on nearby wetlands;
- e) Estuarine vegetation and fauna habitat - impact of proposed development;
- f) Cave - impact of proposed development
- g) Estuarine water quality - loss of nutrients to the estuary; and
- h) Mosquitoes - public amenity.

Conclusion

The EPA has concluded that Amendment 104 to the Shire of Murray Town Planning Scheme No. 4 to rezone Lots 75, 137-139, 293, 299, 322, 672, 727, 729, 738, 1132, 1133 & 1145 from Rural to Special Development can be modified to be capable of meeting the EPA's objectives through the provision of additional conditions identified by the EPA. However, there is insufficient information in relation to the environmental acceptability of the marina and therefore the development application for the marina should be referred to the EPA for assessment under Section 38 of the EP Act. In addition, the EPA finds that the scale of development as proposed in the final IPRSP, including the areas identified for conservation, would provide better protection for the environment than what is proposed by the Shire of Murray in this amendment.

The amendment will allow a variety of land uses to be permitted within the amendment area, such as residential development, tourism, waste water treatment and disposal, a marina and golf course. It is recommended that, given the uncertainty associated with some significant environmental issues, notably nutrient management, foreshore conservation and Avalon Cave, the final Outline Development Plan for the amendment area be submitted to the EPA prior to final approval from the Western Australian Planning Commission.

Other advice

The proposed development outlined in the environmental review is inconsistent with current Government agreed recommendations for regional planning in the Peel Region. Generally, the EPA finds that the scale of development proposed in the final Inner Peel Region Structure Plan, including the areas identified for conservation, may provide better protection for the environment than that which is proposed by the Shire of Murray in this amendment.

The Peel Region is one of the worst areas in the State for the occurrence of mosquito-borne diseases. The issue of mosquitoes is a regional problem, however, that may require a planning strategy or other strategic approach by Government to provide management measures that have environmental consequences consistent with Ramsar, JAMBA and CAMBA values.

Conditions

Section 48D of the Environmental Protection Act 1986 requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the scheme amendment and on the conditions to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

To ensure that the scheme provisions documented in the environmental review are incorporated into the TPS text, the EPA considers that it is necessary to impose a number of conditions to reflect the scheme provisions.

Accordingly, the EPA has developed a set of conditions which they recommend should be imposed if Amendment 104 to the Shire of Murray's Town Planning Scheme No. 4 is approved. These conditions are presented in Appendix 3 and are based on the EPA recommendations in Section 3.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the following relevant environmental factors identified from the discussion of components of the amendment of environmental significance in this report:
 - Vegetation;
 - Declared Rare and Priority Flora;
 - Fauna;
 - Wetlands;
 - Estuarine vegetation and fauna habitat;
 - Cave;
 - Estuarine water quality; and
 - Mosquitoes.
2. That the issue of the marina has not been assessed in this assessment by the EPA of Shire of Murray Town Planning Scheme No. 4 Amendment 104 and the development application for the marina shall be referred to the EPA at a later date.
3. That, subject to the satisfactory implementation of the provisions contained in Amendment 104 to the Shire of Murray Town Planning Scheme No. 4 and the EPA's recommended conditions as set out in Appendix 3, the proposal can be managed to meet the EPA's objectives.
4. That the scale of development as proposed in the final Inner Peel Region Structure Plan would provide better protection for the environment than the proposed amendment by the Shire of Murray.
5. That if the amendment is adopted, the Minister imposes the conditions set out in Appendix 3 of this report.

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1. Introduction

This report is to provide the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the environmental factors relevant to the Shire of Murray Town Planning Scheme (TPS) No. 4 Amendment No 104 to rezone Lots 75, 137-139, 293, 299, 322, 672, 727, 729, 738, 1132, 1133 & 1145 at Point Grey from Rural to Special Development.

The development for tourism, residential and recreational uses at Point Grey was referred to the EPA in February 1996 for assessment under Section 38 of the *Environmental Protection Act* 1986. The level of assessment was set at Public Environmental Review (PER) due to the significance of the potential environmental impacts, and Guidelines issued in May 1996. Prior to submission of the PER, the Shire of Murray initiated an amendment to rezone the land to allow development in accordance with the tourism proposal and consequently the Section 38 assessment was suspended.

Shire of Murray TPS 4 Amendment 104 was referred to the EPA in January 1997 for assessment under Section 48A of the *Environmental Protection Act* 1986, in accordance with the recent amendments to the act. The environmental impacts of the amendment were considered to be significant enough to warrant formal assessment. In accordance with Section 48C of the EP Act, an Environmental Review document was prepared by the responsible authority, the Shire of Murray.

The environmental review document for Shire of Murray TPS 4 Amendment 104 was made available for public review for a period of 60 days, from 17 October to 16 December 1997, in conjunction with the advertising of the Scheme Report. Both reports can be viewed at the offices of the Shire of Murray, and the environmental review document can be viewed at the DEP library.

Following the finalisation of this assessment by the EPA, Shire of Murray TPS 4 Amendment 104 will be submitted to the Western Australian Planning Commission (WAPC) for approval and finalisation of the scheme report and amendment provisions.

In compiling this report, the EPA has considered the information provided in the environmental review, issues raised by the public, specialist advice from government agencies, the responsible authority's response to issues raised, the EPA's own research and, in some cases, research provided by other expert agencies.

A description of the proposed amendment is provided in Section 2 of this Report. Section 3 discusses the components of the scheme amendment that are of environmental significance and relates these to relevant environmental factors and Section 4 provides information on the environmental conditions which should be applied if the amendment is approved. Other EPA advice is outlined in Section 5. Section 6 presents the EPA's conclusion and Section 7 the EPA's recommendations.

A list of people and organisations that made submissions is included in Appendix 1. A list of references is contained in Appendix 2 and the list of recommended Ministerial conditions is provided in Appendix 3. Appendix 4 contains the scheme provisions as contained in the environmental review for this amendment.

The DEP's summary of submissions and the responsible authority's response to those submissions (Bowman Bishaw Gorham, 1998a) has been published separately and is available on request from the Shire of Murray.

2. The scheme amendment

The scheme amendment is to rezone Lots 75, 137-139, 293, 299, 322, 672, 727, 729, 738, 1132, 1133 & 1145, at Point Grey from "Rural" to "Special Development". This area is known as the Point Grey Peninsula.

The Point Grey Peninsula is located directly east of the Dawesville Channel on the eastern shores of the Peel Inlet and the Harvey Estuary in the Shire of Murray (Figure 1). The area to be rezoned is approximately 1 159 ha and is adjacent to System 6 areas C50 and C51, and near Lake McLarty and Lake Mealup which constitute System 6 area C52 (Figure 2). The Peel-Harvey Estuary is recognised as a wetland of international importance under the Ramsar Convention and is on the Register of the National Estate. Lake McLarty and Lake Mealup are also Ramsar listed.

In addition to areas covered by the System 6 recommendations (reserves 4990 and 27528), a number of foreshore reserves directly abut the amendment area. These include CALM reserve 11718, local authority reserve 33039 and reserve 2738 (Conservation of Flora and Fauna) (Figure 2).

The rezoning will allow the development of the area in accordance with an Outline Development Plan (ODP) (Figure 3). The ODP submitted to the DEP allows for the development of:

- 1500 fully serviced residential village allotments, ranging in size from 500m² to 2 000m²;
- 200 low density Special Residential lots (180 serviced and 20 unserviced lots) and 20 unserviced Rural-Residential lots;
- tourist accommodation and associated facilities, including a wilderness lodge and chalets, and waterfront and harbourside villages;
- a marina and sailing club;
- reserves for conservation, recreation and open space;
- an 18 hole golf course;
- an eco-tourist village on the margin of the proposed constructed wetland at Robert Bay; and
- a sewage treatment plant and a eucalypt woodlot irrigated with treated effluent.

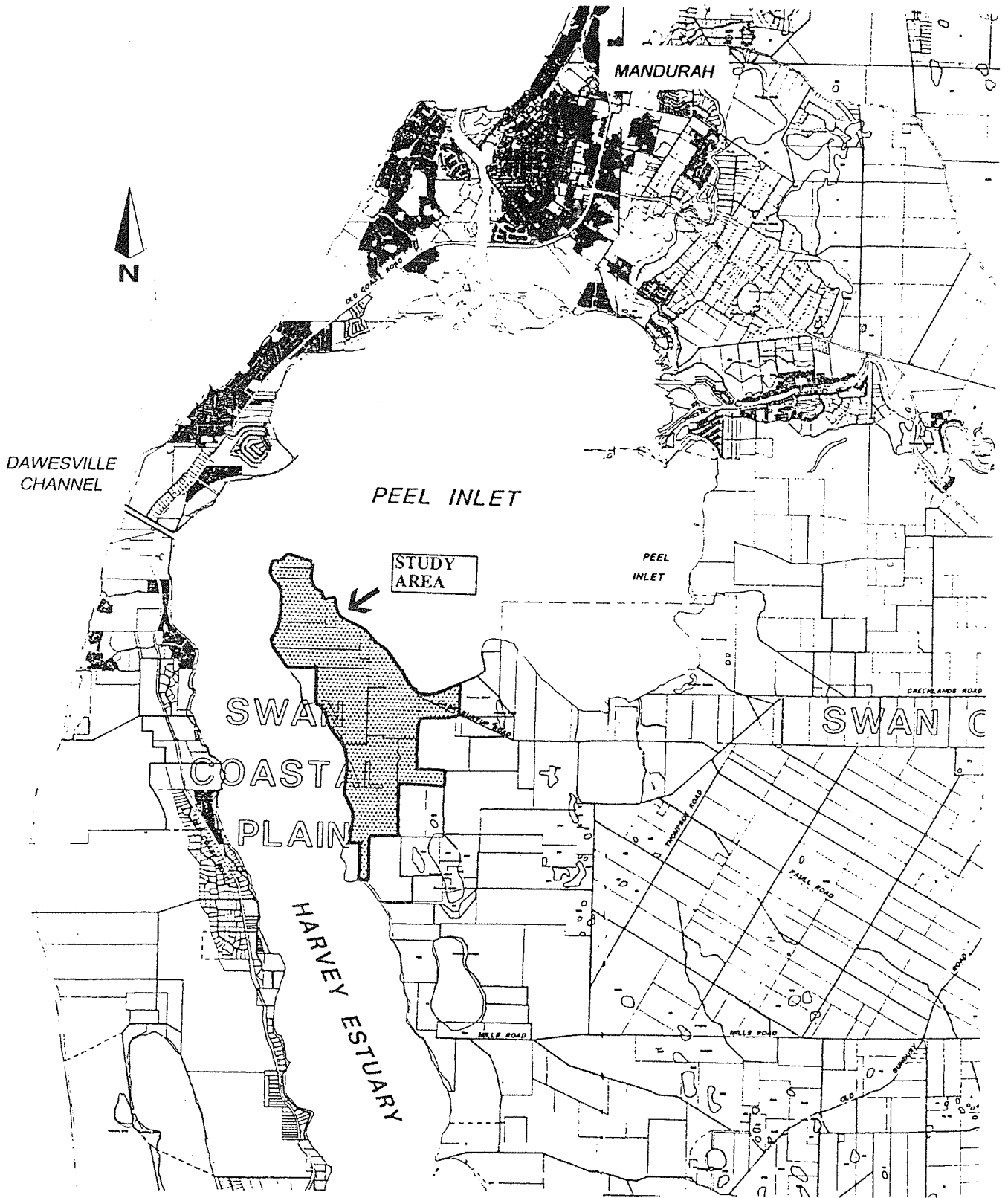
The development will be serviced with underground power and telecommunications. The provision of natural gas is not available at this time.

The provision of water by the Water Corporation is not available and the development has been planned around the principle that the water supply should be drawn from the site. Potable water will be drawn from the Leederville aquifer and water for irrigation may be provided by a number of sources, such as treated effluent and/or run-off from the Robert Bay Drain Catchment. All effluent, including stormwater and sewage, will be collected, treated and disposed of on-site.

Remnant vegetation remains on nearly one third of the site while around two thirds of the site has been cleared or parkland cleared to allow for the grazing of sheep.

There will be a continuous system of recreational and conservation areas around the entire Point Grey peninsula with the exception of coastal breaches at the proposed marina and sailing club sites (Figure 3). Areas of private land will also be set aside for conservation, including an area on the tip of the promontory, areas developed for rural residential purposes, and a 95ha area in the south west of the development site.

A marina is proposed for a site on the promontory on the north-west flank of the Point Grey peninsula and a sailing club on the north-east side.



Scale: 1:115 000

Source: Bowman Bishaw Gorham, 1997

Figure 1 : Location of the Point Grey Peninsula and area proposed to be rezoned in Shire of Murray TPS 4 Amendment 104.

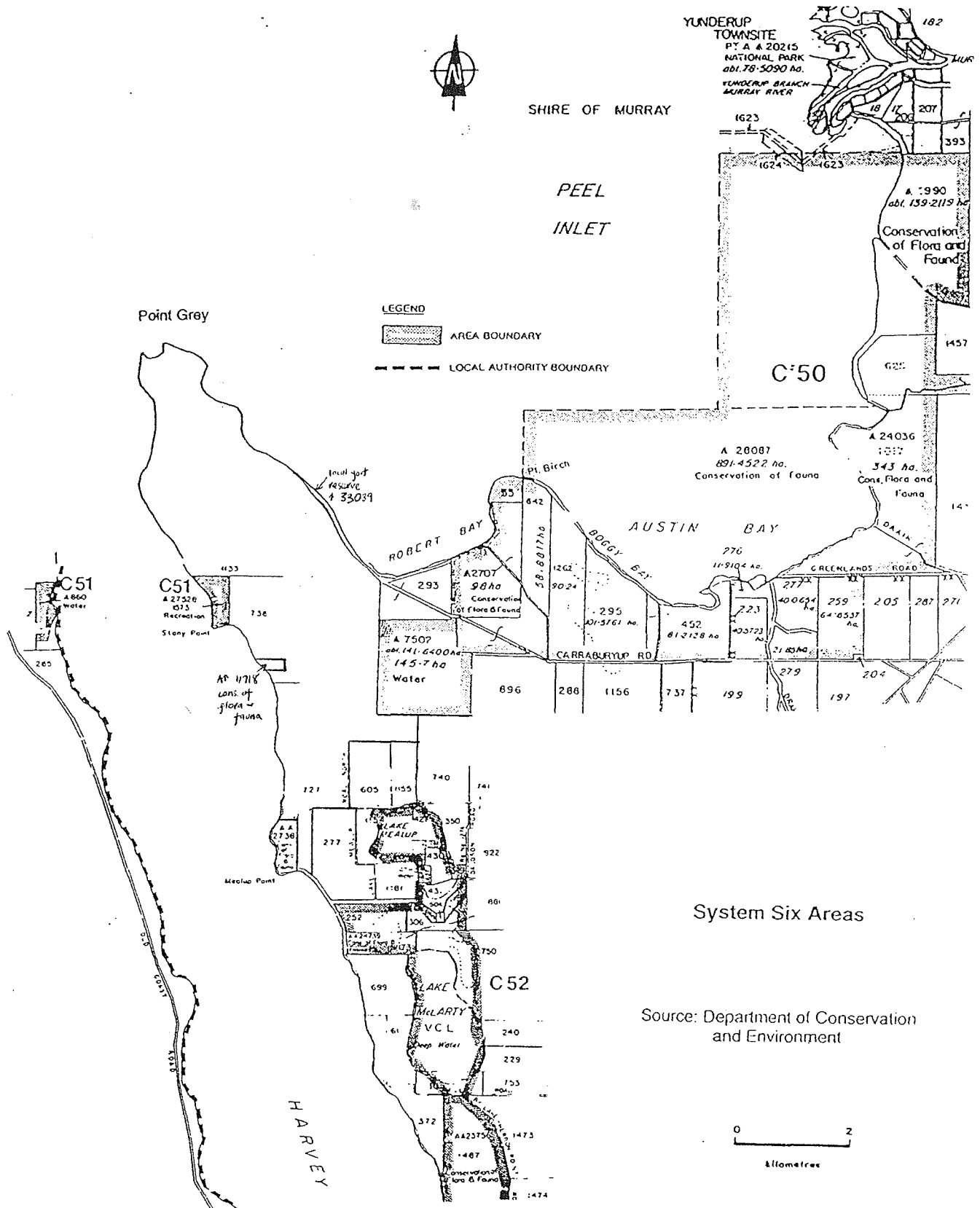


Figure 2: Location of adjacent System 6 areas C50 and C51

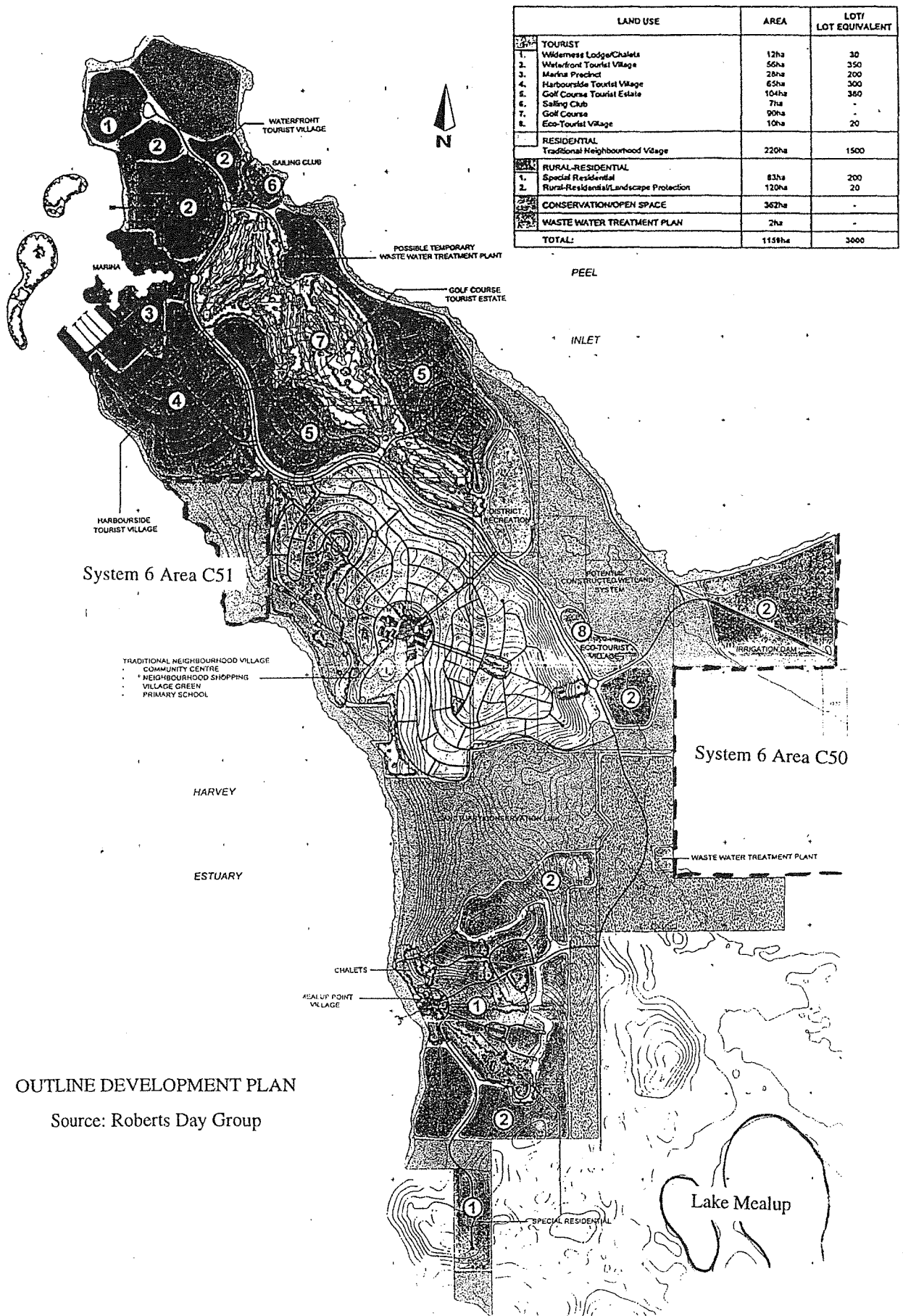


Figure 3: Outline Development Plan submitted in the environmental review (Bowman Bishaw Gorham, 1997) for the proposed development of the area to be rezoned in Shire of Murray TPS 4 Amendment 104

The design of the marina has been modified from that proposed in the environmental review document in response to concerns raised during the submission period (Figure 4). The marina development is associated with a Harbourside Tourist Village and a Waterfront Tourist Village. A traditional neighbourhood village is planned for the central area of the peninsula and this will include a community centre, neighbourhood shopping, areas of open space and a primary school.

It is proposed that the development of the Point Grey peninsula will support a population of around 7 000.

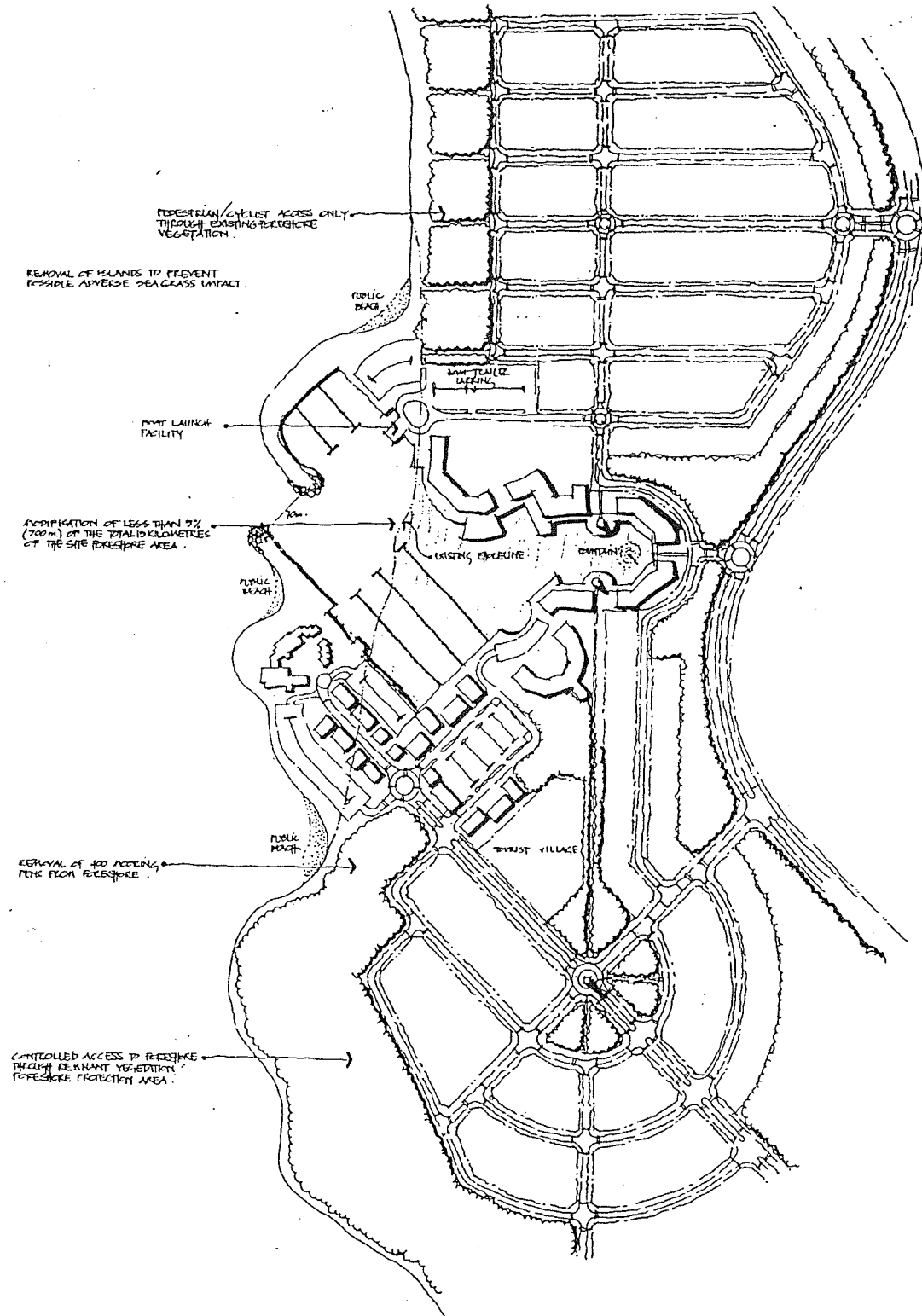
The development outlined in the ODP as described above is inconsistent with recommendations for regional planning. The final Inner Peel Region Structure Plan (IPRSP) (WAPC, 1997) was released by the State Government in December 1997 (Figure 5). Inconsistencies of the proposed amendment with the IPRSP include some areas that are proposed to be included in the Peel Regional Park (PRP) are not included in the areas proposed for conservation in the ODP. The IPRSP also recommends tourism, conservation and rural living land uses, rather than residential development.

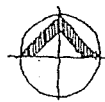
The scheme amendment, including proposed modifications to the marina design, is summarised in Table 1. The description of the proposed scheme provisions is taken directly from Table 6.2 of the environmental review (Bowman Bishaw Gorham, 1998a).

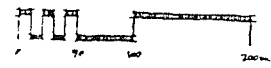
Table 1. Summary of scheme amendment

Element	Description
existing zoning	rural
proposed zoning	special development
amendment area	1159 hectares
ODP characteristics	<ul style="list-style-type: none"> • 1500 fully serviced residential village allotments, ranging in size from 500m² to 2 000m² (220 ha); • 200 low density Special Residential lots (180 serviced and 20 unserviced lots) and 20 unserviced Rural-Residential lots (203 ha); • tourist accommodation and associated facilities, including a wilderness lodge and chalets, and waterfront and harbourside villages (259 ha); • a marina and sailing club (13 ha); • reserves for conservation, recreation and open space (362 ha); • an 18 hole golf course (90 ha); and • an eco-tourist village on the margin of the proposed constructed wetland at Robert Bay (10 ha).
water supply	potable groundwater abstracted from the Leederville aquifer
effluent disposal	onsite disposal utilising a tertiary treatment plant, reticulated sewerage network and a eucalypt woodlot irrigated with the treated effluent.

Proposed scheme provisions			
Subdivision and development	Subdivision and development shall generally be in accordance with an approved Outline Development Plan		
Permitted uses "P" and "AA"	<table border="1"> <tr> <td> <p>"P" (permitted)</p> <ul style="list-style-type: none"> • Golf course/Clubhouse, and • Club Premises. </td> <td> <p>"AA" (subject to Council approval)</p> <ul style="list-style-type: none"> • Chalet Park; • Bed & Breakfast Accommodation; • Hotel; • Hospital; • Education Establishment; and • Marina. </td> </tr> </table>	<p>"P" (permitted)</p> <ul style="list-style-type: none"> • Golf course/Clubhouse, and • Club Premises. 	<p>"AA" (subject to Council approval)</p> <ul style="list-style-type: none"> • Chalet Park; • Bed & Breakfast Accommodation; • Hotel; • Hospital; • Education Establishment; and • Marina.
<p>"P" (permitted)</p> <ul style="list-style-type: none"> • Golf course/Clubhouse, and • Club Premises. 	<p>"AA" (subject to Council approval)</p> <ul style="list-style-type: none"> • Chalet Park; • Bed & Breakfast Accommodation; • Hotel; • Hospital; • Education Establishment; and • Marina. 		
Foreshore and conservation reserve management	Prior to construction a Foreshore and Conservation Reserve Management Plan shall be prepared for the adjoining reserve areas following consultation with the EPA, PIMA, CALM and the Shire of Murray.		
Nutrient and irrigation management	Prior to construction, a Nutrient and Irrigation Management Plan shall be prepared in consultation with the EPA.		
Bush fire management	The development of land within the Rural-Residential allotment areas shall be subject to a Bushfire Management Plan approved by Council and the Bushfires Board of Western Australia.		
Rural-residential	<p>The Rural-Residential areas (lots > 4 000m²) shall be subject to scheme provisions covering the following issues:</p> <ul style="list-style-type: none"> • landscape conservation • potable water supply • effluent disposal • fence • stock • firebreaks 		
Marina management	Prior to construction of the marina, a Marina Management Plan shall be prepared in consultation with PIMA, DoT and the Shire of Murray.		
Water supply management	Prior to construction, a Water Supply Management and Monitoring Plan shall be prepared in consultation with the EPA on advice from the WRC.		
Landscape management	Prior to construction, a Landscape Plan shall be prepared for each stage of the development, in consultation with the EPA.		
Waterbird monitoring	Prior to construction, a Waterbird Monitoring Plan shall be prepared for those areas adjacent to important waterbird habitat in consultation with the EPA on advice from CALM and PIMA.		
Construction management	Prior to construction, a Construction Management Plan shall be prepared for each stage in consultation with the EPA on advice from the Shire of Murray.		
Robert bay wetlands management	Prior to construction of the Robert Bay Wetland, a Wetland Management Plan shall be prepared in consultation with the EPA on advice from PIMA, the Shire of Murray and WC.		




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Figure 4: Modified marina design

INNER PEEL REGION FINAL STRUCTURE PLAN - 1997

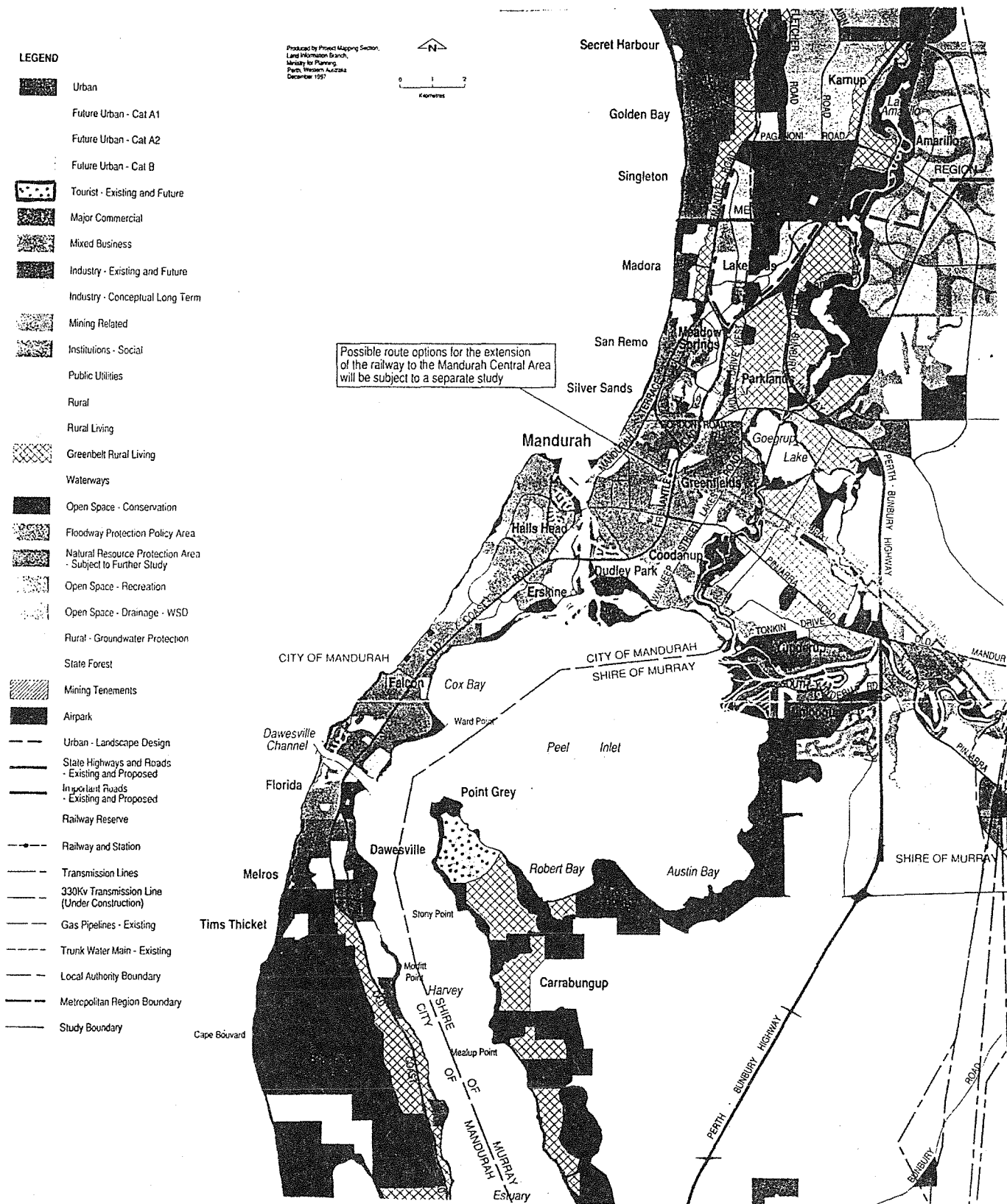


Figure 5: Extract from the Inner Peel Region Structure Plan 1997.
Source: WAPC, 1997.

3. Environmental considerations

3.1 Relevant environmental factors

Section 48(D) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the scheme and the conditions, if any, to which the scheme should be subject. In addition, the EPA may make recommendations as it sees fit.

The proposed amendment is to rezone the Point Grey peninsula from “Rural” to “Special Development”. This will allow a variety of land uses to be permitted within the amendment area, such as residential development, tourism, waste water treatment and disposal, and a marina.

Due to its complex nature, this amendment raises a number of quite separate environmental issues. In the majority of instances, these issues involve a number of environmental factors. For this reason, it is considered that a discussion presented under headings related to the relevant factors would unnecessarily complicate matters and so this report will outline the assessment of the relevant factors by discussing components of the amendment.

In order to fulfil requirements under Section 48(D) of the *Environmental Protection Act 1986*, this report will cross reference the components of the development that have environmental significance with the relevant environmental factors.

The following factors were identified from the consideration of the issues identified below. The identification process is summarised in Table 2 and a summary of the assessment is set out in Table 3.

The following are considered to be the environmental factors relevant to the proposal:

- a) Vegetation - significance of remnant vegetation
- b) Declared Rare and Priority Flora;
- c) Fauna - impact of proposed development on waterbirds;
- d) Wetlands - impact of proposed development on nearby wetlands;
- e) Estuarine vegetation and fauna habitat - impact of proposed development;
- f) Cave - impact of proposed development
- g) Estuarine water quality - loss of nutrients to the estuary; and
- h) Mosquitoes - public amenity.

The above relevant factors were identified from the EPA’s consideration of all preliminary environmental factors outlined in the environmental review document, the amendment characteristics (including significance of the potential impacts), public and government submissions (Appendix 1) and the adequacy of the responsible authority’s response, along with a review of appropriate references (Appendix 2). On this basis, the EPA considers that the impacts on Declared Rare Fauna, groundwater quantity, groundwater quality, surface water quality, odours, noise and dust, turbidity, Aboriginal heritage, risk and hazards and other issues raised in the submissions, including unresolved management issues, scale of development, loss of rural/agricultural areas, other alternatives, previous assessment, System 6 update, and public costs of the development, do not require further evaluation by the EPA.

Table 2: Identification of Environmental Factors Requiring EPA Evaluation

Preliminary Factor	Proposal Characteristic	Government Agency and Public Comments	Identification of Relevant Factors
Biophysical			
Vegetation communities - significance of remnant foreshore vegetation	<p>Remnant vegetation remains on nearly one third of the site as around two thirds of the site is cleared or parkland cleared to allow for the grazing of sheep.</p> <p>There will be a continuous system of recreational and conservation areas around the entire Pt Grey peninsula with the exception of coastal breaches at the proposed marina and sailing club sites.</p> <p>Areas of private land will also be set aside for conservation.</p> <p>18ha of remnant vegetation will be cleared for development, around 5% of the existing remnant vegetation.</p>	<ul style="list-style-type: none"> The project will result in increased pressure on the existing reserves within and adjacent to the development area from inflated public access and recreation (CALM). Further discussion of the potential impacts of the proposed development, such as fire, rubbish dumping, threats to wildlife from domestic pets, weeds, degradation of the environment from off-road vehicles, management of human pressures, and dieback, on existing nature reserves adjacent to the amendment area is required. The Foreshore Reserve Boundary is considered to be unsatisfactory, as they do not afford appropriate protection to remnant vegetation, habitat, and soils that are prone to erosion (WRC and PIMA). The proponent has to date failed to demonstrate that sound environmental planning principles have been used to identify appropriate foreshore reserves at Point Grey. It is considered that approval to the proposed ODP for Point Grey in its present form would undermine the integrity of the emerging State-wide foreshore policy being prepared by State and Local Government in partnership with the community (WRC and PIMA). WRC & PIMA do not accept private ownership of Foreshores in urban areas. 	<i>Requires further evaluation. Considered to be a relevant factor.</i>
Declared Rare and Priority Flora	<p>The biological surveys commissioned by the owner of the land, TS Plunket Pty Ltd, did not find any Declared Rare and Priority Flora on the site.</p> <p>The proposed development will impact areas of remnant vegetation, primarily within the parkland vegetation to the south and the banksia woodland on the north-west flank of the peninsula.</p>	<p>The flora and fauna survey for the environmental review, undertaken on only 2 days in April, is not adequate to determine the diversity of species present. The large area of land involved in this proposal and the presence of ten different vegetation types suggests more time would have been required for an adequate plant census. The flora survey should have been conducted in spring to allow accurate identification of plants using floral structures and to observe species which would be dormant over summer and early autumn. Thus the survey must seriously underestimate the biodiversity of the site. (WSWA).</p>	<i>Requires further evaluation. Considered to be a relevant factor.</i>
Fauna - impact of proposed development on fauna and habitat	<p>The Peel-Harvey Estuary is a wetland of international importance, recognised by the Ramsar Convention. The Ramsar wetland area extends to the high water mark of the estuary and includes nearby Lakes Mealup and McLarty.</p> <p>The intertidal flats in Robert Bay, on the eastern side of the development, provide feeding and loafing habitat for many water birds including trans-equatorial migratory waders, many of which are protected under international agreements with China and Japan (JAMBA & CAMBA).</p>	<ul style="list-style-type: none"> The proponent has not supplied sufficient data to determine whether the area proposed for the boating facility is a significant area of waterbird habitat (CALM). The area that directly abuts the intertidal flats is proposed for rural-residential development. No discussion of management of impacts on the waterbirds from pedestrians, domestic pets, off-road vehicles or boats is made in the environmental review (LMPS). Foreshore reserves can be broken only by narrow openings if they are to function effectively as wildlife corridors. It is considered that the large break that would be caused by the current proposed marina and the 10 metre wide access corridors from urban areas to the foreshore are considered unacceptable (PIMA & WRC). <p>No specific actions were proposed in the environmental review to minimise impacts on waterbirds in the System 6 areas and other reserves due to the proposed increase in human population (LMPS).</p>	<i>Requires further evaluation. Considered to be a relevant factor.</i>

Declared Rare Fauna - impact of proposed development on fauna and habitat	<p>The distribution and habitat of the following Declared Rare Fauna occur within the amendment area:</p> <ul style="list-style-type: none"> • Peregrine Falcon • Carnaby's Cockatoo • Baudin's Cockatoo • Southern Brown Bandicoot • Carpet Python 	<ul style="list-style-type: none"> • The fauna study of 20 hours without trapping is too brief to be called adequate. Research at the nearby Goodale Sanctuary south-east of Point Grey and at Lake Mealup suggests that the Point Grey Fauna list is far from complete. • Inadequate management measures are proposed to protect the potential habitat for the carpet python (LMPS). 	<p>No Declared Rare Fauna or any evidence of their recent presence was found during field surveys of the amendment area. Two areas of habitat which could support gazetted rare fauna were identified as limestone outcrops on southern parts of the western shoreline, and remnant tall Tuart trees. The mature Tuart trees are proposed to be retained within the golf course and the limestone outcrops have been precluded from development. Further investigation will be made to determine the presence or absence of the Carpet Python and provisions incorporated into the Foreshore and Conservation Area Management Plan as required.</p> <p><i>No further evaluation required.</i></p>
Wetlands - impact of proposed development	<p>A large wetland complex exists along the eastern side of the development area, however, the wetland is somewhat degraded. It is proposed that a series of artificial wetlands be constructed on this site.</p> <p>Ramsar lakes McLarty and Mealup are within 1.5km of the amendment area and NPNC Reserve 4990, containing a wetland, is directly adjacent to the proposed woodlot area.</p>	<ul style="list-style-type: none"> • The development threatens significant wetlands, including Lake McLarty and Lake Mealup. These wetlands are RAMSAR listed wetlands and consequently if this proposal was approved, the Government may be in breach of the RAMSAR Convention (CCWA). • The environmental review does not deal at all with the potential impacts of the development on Lake Mealup and Lake McLarty as required by the EPA's Environmental Review Instructions (LMPS). 	<p><i>Requires further evaluation. Considered to be a relevant factor.</i></p>
Estuarine vegetation - loss of seagrass	<p>Seagrass meadows are important components of the Peel-Harvey Estuary and there are many areas around the Pt Grey peninsula where seagrasses are flourishing.</p> <p>The construction of the marina requires the excavation of around 5ha from the shoreline and seagrass beds on the north-western side of the peninsula.</p>	<ul style="list-style-type: none"> • The area of the shoreline and estuary bed that are proposed to be dredged for the construction of the marina contain seagrass beds that are considered valuable in terms of providing habitat and feeding grounds for the low order marine and estuarine creatures which inhabit the Peel-Harvey estuary (PIMA & WRC). The proposal to use signage to protect seagrasses from boating is totally inadequate (LMPS). • The only boating facility that could be developed would have to be land based, and at a scale which would minimise impacts on the Foreshore Reserve. Such a scale would mean that the only breach of the foreshore reserve would be for an entrance channel into the marina, similar to those at Mandurah Quay and Port Mandurah (WRC and PIMA). • Dredging and reclamation of the estuary, other than dredging for an entrance channel to the land-based marina should not be allowed (WRC and PIMA). 	<p><i>Requires further evaluation. Considered to be a relevant factor.</i></p>
Groundwater quantity - availability of potable water supply	<p>Potable water for the development is proposed to be supplied through the abstraction of groundwater from the Leederville unconfined aquifer. The development is planned to be supplied with water in stages, consistent with construction.</p> <p>At full development, the level in the Leederville aquifer is predicted to drop by 1.5m.</p>	<ul style="list-style-type: none"> • The impact of increased bore-water use on the bores and land of neighbouring land users has not been addressed (AgWA). • The information presented in the environmental review is inadequate to sufficiently characterise the hydrology of the area to justify claims that the development will not have unacceptable environmental effects. There is a lack of site-specific detail upon which to base and verify the modelling (LMPS). • No information is provided to support the claim that lowering the Leederville aquifer will not affect the superficial aquifer (LMPS). 	<p>Modelling suggests that there is sufficient water in the Leederville aquifer to supply the amendment area at full development with minimal impact on existing groundwater resources.</p> <p>There are no other users of the Leederville aquifer in the surrounding area. All existing bores and wells abstract from the unconfined Superficial aquifer which should not be impacted.</p> <p><i>No further evaluation required.</i></p>

Pollution Management			
Groundwater quality - impact of on-site effluent disposal	<p>All effluent, including sewage from the Pt Grey development, will be collected, treated and disposed of on-site. The majority of the site will be serviced by a reticulated network, culminating in a tertiary treatment plant incorporating Biological Nutrient Removal (BNR) technology. The proposed final effluent concentration will be 1 ppm total phosphorus and 5 ppm total nitrogen.</p> <p>Treated effluent will initially be used to irrigate the eucalypt woodlot until such time as the volume of effluent is sufficient to irrigate the golf course. Disposal of wastewater in winter will be to the woodlot.</p>	<ul style="list-style-type: none"> The aquifer from which drinking water is proposed to be abstracted is unconfined and as such is vulnerable to contamination. A modelling exercise was undertaken to determine the estimated length of time before phosphorus would leach through the soil to the drinking water aquifer, however this exercise was not performed for nitrogen. An estimate of time before the aquifer begins to become contaminated with nitrates is needed so preventative and protection measures can be considered (PIMA & WRC). Both the potable and irrigation water descriptions do not account for the potential salinisation of groundwater as consumption increases (AgWA). Salinisation of the groundwater is also possible if 'salty' water from the proposed artificial wetland at Robert Bay is utilised for irrigation of the golf course and landscape vegetation (PIMA & WRC). 	<p>Potable water exists, and will be extracted from, the confined Upper Leederville aquifer at a depth of around 140 m. This water source is separated from the superficial unconfined aquifer by impermeable clays and consequently will not be influenced by superficial aquifer water quality factors.</p> <p>In addition, hydraulic heads in the Leederville indicate upward heads which will act against downward flow from the superficial aquifer.</p> <p>Reverse osmosis desalination equipment will be deployed in the event that salinity levels increase in the potable water supply. Groundwater supply projections have accommodated the potential for increasing salinity.</p> <p><i>No further evaluation required.</i></p>
Estuarine water quality - impact of on-site effluent disposal	<p>All effluent, including sewage from the proposed Pt Grey development, will be collected, treated and disposed of on-site.</p> <p>The majority of the site will be serviced by a reticulated network, culminating in a tertiary treatment plant incorporating Biological Nutrient Removal (BNR) technology. The proposed final effluent concentration will be 1 ppm total phosphorus and 5 ppm total nitrogen.</p> <p>Treated effluent will initially be used to irrigate the eucalypt woodlot in the south-eastern portion of the amendment area until such time as the volume of effluent is sufficient to irrigate the golf course. Disposal of wastewater in winter will be to the woodlot.</p>	<ul style="list-style-type: none"> The provision of a sewer by the Water Corporation is recommended, given the scale of the proposed development (HDWA). The calculations for the proposal were based on the lower extremity of effluent concentrations expected from a BNR plant. Consequently the estimated nutrient loads to the estuary as stated in the environmental review may be lower than what are actually achievable (PIMA & WRC). The environmental review gives no indication of the woodlot's capacity to absorb the volume of effluent proposed to be applied to the area without surface runoff or tree failure and does not consider rainfall during winter (LMPS). The environmental review states that N export from the development area to the Peel-Harvey estuary is to be 4.2 tonnes/annum, which equates to approximately 1% of the total N export from the estuary to the ocean. One of the overall objectives of the Peel-Harvey EPP is to reduce nutrient inputs to the estuary. The Point Grey proposal is considered to be contrary to that objective as the development proposes a significant and unacceptable amount of N export to the estuary (PIMA & WRC). 	<p><i>Requires further evaluation. Considered to be a relevant factor.</i></p>
Odours - impact of waste water treatment plant	<p>Odours may be experienced from the waste water treatment plant and from algal accumulations.</p>	<p>none</p>	<p>The waste water treatment plant is located at least 500m away from residential development. Due to the improvement in water quality of the estuary, excessive odours from algal accumulation is not expected to effect residents.</p> <p><i>No further evaluation required.</i></p>
Noise and dust - impact of construction	<p>Noise and dust should be taken into consideration during the construction phase.</p>	<p>none</p>	<p>Prior to construction, a Construction Management Plan shall be prepared for each stage in consultation with the EPA on advice from the Shire of Murray (Scheme provision 12).</p> <p><i>No further evaluation required.</i></p>
Turbidity - impact of dredging	<p>Potential turbidity impacts include plume generation, resulting in water discolouration and smothering of benthic fauna in settlement areas. This may occur during the construction of the marina and sailing club as a result of dredging.</p>	<p>none</p>	<p>A Dredge Spoil Management Plan will be prepared in accordance with PIMA requirements and a Water and Sediment Quality Monitoring Plan implemented.</p> <p><i>No further evaluation required.</i></p>

Social Surroundings			
Aboriginal heritage - potential for heritage sites	An archaeological and ethnographic aboriginal heritage study was undertaken. One sacred tree was identified in the vicinity of the residential village and a skeleton may be located in the area proposed for the Wilderness Lodge.	It was noted that no Aboriginal site will be impacted and the recommendations put forward by the consultants to the proponents are endorsed by the Aboriginal Affairs Department. The developers should continue to recognise and involve Aboriginal people during the development (AAD).	All site works will be carried out in accordance with the provisions of the Aboriginal Heritage Act 1972 and continued consultation with the local Aborigines is intended. <i>No further evaluation required.</i>
Mosquitoes - regional issue	The Point Grey peninsula contains areas of samphire marsh, notably at Robert Bay and between Stony Point and Mealup Point, which act as a breeding ground for mosquitos and is well within the flight radius of mosquitos breeding outside the amendment area. Since the opening of the Dawesville Channel, mosquito carriers have begun to breed all year round in the Peel-Harvey Estuary and surrounding areas. The proposal includes the provision to create no additional mosquito breeding areas and to design water management plans with the objective of reducing mosquito breeding habitat.	<ul style="list-style-type: none"> The exposure of potential residents to mosquito-bourn disease has not been adequately addressed. The long term effects of fortnightly spraying on the ecology of the area and resident population are also not known. The Robert Bay wetland will potentially create a new mosquito breeding ground, however, as no commitment has been made to construct the wetland, a full assessment of the risk cannot be made (AgWA). There are no proven mosquito control measures which are effective in constructed wetlands (HDWA). No consideration is made of insect movement from areas outside the development within a 5km radius, as the environmental review identifies potential mosquito breeding sites within the development area only (LMPS). Mosquito control measures may lead to the contamination of local water resources and wetlands. Should chemical management be utilised, it may have a detrimental effect on bird breeding and associated wetland habitat and feeding areas. The WRC does not support management measures such as the filling of wetlands or damplands, or drainage of such areas (PIMA & WRC). 	<i>Requires further evaluation. Considered to be a relevant factor.</i>
Risk and hazards	Areas such as the waste water treatment plant and the groundwater abstraction bores are potentially hazardous.	none	Adequate buffers separating potentially hazardous facilities will be established in accordance with EPA criteria for individual fatality risk and the DME's requirements in respect of public safety. <i>No further evaluation required.</i>
Other			
Unresolved management issues		<ul style="list-style-type: none"> The responsible authority has indicated that management plans for many environmental issues have been deferred until the project is approved. However, there is no guarantee that satisfactory management plans will be developed or even if it is possible to provide adequate protection for the environment. Any management plans prepared by the responsible authority should be available for public review. A decision should be made on the construction of the Robert Bay Wetland. If the construction is not to proceed, what will happen to the proposed site? 	The requirement for Management Plans to be prepared in consultation with appropriate regulatory agencies will be incorporated in the Scheme Amendment Special Provisions. Management Plan preparation will therefore be a legal requirement of development. <i>No further evaluation required.</i>
Other alternatives		The environmental review does not discuss any alternatives or compromises. Developments which allow a small increase in international and local tourism without major alterations to the natural attributes could be researched in a feasibility study (GS).	The Outline Development Plan is the result of a four year programme of research. The ODP has been continually revised to take into account issues as they have arisen. The ODP is considered to be the best alternative that achieves the desired outcome of the proponent. <i>No further evaluation required.</i>

System 6 update		The development should be halted until the finalisation of the System 6 update as it is believed by local residents that parts of the Pt Grey area may be recommended for conservation by the EPA.	No area of land within the amendment area has been identified in the System 6 Update at this time. <i>No further evaluation required.</i>
Scale of development		<ul style="list-style-type: none"> Concerns were raised in regard to the huge impact that an additional 7 000 people would have on such a sensitive environment. Impacts would include threats to wildlife from domestic animals, the introduction of exotic species into the bushland from garden plants, rubbish dumping, degradation of the environment from off-road vehicles etc and the impact of fire on the surrounding environment (CCWA). The placement of a new town of 7 000 people only 20km from Pinjarra, in an area that has poor infrastructure, seems inappropriate due to the duplication of essential services and cost of the provision of these services (MEAC). 	<i>Addressed in Other advice.</i>
Previous assessment		<p>In 1987, the EPA rejected an earlier development proposal for the same area of Point Grey (EPA Bulletin 306). The area has not changed and is no more suitable for a development today, ten years later. The impact of the Point Grey development on surrounding nature reserves would still be severe and unacceptable and the impact on the water quality of the estuary itself remains of concern (CCWA).</p> <p>A summary of the report and recommendations is as follows:</p> <ul style="list-style-type: none"> The development was seen to have the potential to contribute phosphorus and nitrogen into the estuarine ecosystem through the disposal of treated sewage effluent and septic tank waste, the application of fertilisers on domestic lawns and gardens, and the leaching of agricultural fertiliser already in the soil. The proximity of residential and rural residential type lots abutting the System 6 reserves was seen to have adverse impacts, given the proposed population levels, unless stringent management conditions were implemented. The foreshore reserve and proposed open space areas were not seen to be adequate as all vegetation associations were not thought to be adequately represented in conservation areas. Point Grey was seen to be the most significant topographical feature in the Peel Harvey system and consequently requiring conservation and landscape protection priority. Reduced environmental amenity would have been experienced by Point Grey residents if the proposal progressed, including significant problems associated with macroalgal accumulations along the foreshores, contributing to odour and beach fouling and high mosquito numbers. 	<p>Significant advances have been made over the last decade in understanding and describing the movement of phosphorus and nitrogen through sandy soil profiles on the Swan coastal plain.</p> <p>The ODP provides for the retention of major tracts of land for the purpose of conservation, including a continuous core area of foreshore and upland vegetation forming a link between Harvey Estuary and Peel Inlet totalling around 100ha.</p> <p>The arrangement of land uses proposed by the ODP and the requirement for foreshore and conservation area management plans to be finalised and implemented prior to construction leads the conclusion that existing reserves can be acceptably managed under the influence of the proposed land uses and additional local population.</p> <p>The earlier land use proposal was put forward at a time when water quality in the adjacent estuarine waters was poor leading to problems with blooms of macroalgae and phytoplankton.</p> <p>The completion of the Dawesville Channel in 1994 has brought about a dramatic improvement in water quality off Point Grey, in particular on the western shores, but also on the eastern shores.</p> <p>Key concerns such as water quality, foreshore and mosquitoes addresses as specific issues.</p> <p><i>No further evaluation required.</i></p>
Loss of rural/ agricultural areas		<ul style="list-style-type: none"> Limited consideration has been given to the impact of the proposed development on neighbouring land uses. Adequate vegetation and suitable buffers separating the development from nearby rural properties is essential, as agricultural activities should not be inconvenienced or limited as a result of the development proceeding. The requirements of urban zonings, such as odour and noise controls, should not be imposed on neighbouring rural landholders as a result of urban development (AgWA). Once this development is established, there will be a tendency for expansion of residential areas, encroaching into good agricultural land. 	<p>Apart from around 1500m boundary length of areas proposed for zoning as Rural Residential/Landscape Protection and adjacent land, the ODP proposes that only land zoned as Conservation space will abut neighbouring land. The focus of tourist and residential uses is in the centre and far north of the site.</p> <p>The smallest separation distance between land proposed for residential uses, and rural land is approximately 1km.</p> <p><i>No further evaluation required.</i></p>

Regional planning considerations		<ul style="list-style-type: none"> • The proposed development as outlined in the environmental review and the ODP is not consistent with the recommendations for regional planning. • The 'Boating facilities study for the Peel Region (1996)' by DoT identified the need for regional boat launching ramps and finger jetties at Point Grey rather than a boat harbour or marina. Further investigation should be made into the appropriateness and the location of the proposed marina and sailing club developments (PIMA & WRC). 	<i>Addressed in Other advice.</i>
Public costs of the development		<ul style="list-style-type: none"> • The cost of treating water by reverse osmosis is more than twice the cost of water treatment in the Perth metropolitan area. The operating cost of the treatment system proposed for the development may be at least three times the cost of metropolitan waste water treatment. All costs will need to be met by either the residents of the Point Grey area or via a subsidy paid by ratepayers in the Shire of Murray (LMPS). • Other ongoing costs that need to be considered and allocated funding include long term maintenance of drainage systems, road maintenance, dredging, general marina maintenance, mosquito control, removal of algal accumulations (at least in the short to medium term), and fire control (LMPS). 	<p>Matters of costs and funding are more appropriately dealt with by the Shire, developer and purchasers.</p> <p><i>No further evaluation required.</i></p>

Table 3: Summary of Assessment of Relevant Environmental Factors

Environmental Factor	Relevant Area	EPA Objective	Assessment	EPA advice
Biophysical				
Vegetation communities - significance of remnant foreshore vegetation	The Swan Coastal Plain.	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	<p>The proposed development is based on the assumption that conservation reserves can be acceptably managed to protect recognised values from the pressures of human usage and general presence (Bowman Bishaw Gorham, 1998). This assumption also forms the basis for the process of "Conservation through Reserves" (for example the System 6 Red Book Report, DCE, 1983), a management philosophy which has been the cornerstone of the State Government's approach to conservation since the 1970's.</p> <p>The response to submissions (Bowman Bishaw Gorham, 1998) also notes that "The fact that reserves can occur adjacent to development and that public access into reserves can be managed is demonstrated by the current practice of creating National and Regional Parks and gazetted conservation reserves within the Metropolitan area."</p> <p>As the EPA is unable to assess the proposed marina development at this time, the development application for the marina should be referred to the EPA under Section 38 of the Act when finalised. Further information considered critical to the assessment is the utilisation of the proposed site by JAMBA and CAMBA waterbird species as identified in section 3.3.</p>	<p>Having particular regard to:</p> <ul style="list-style-type: none"> a) the retention of the majority of remnant vegetation on site (only 5% of the existing remnant vegetation is proposed to be cleared); b) the provision contained in the proposed amendment which requires the preparation of a Foreshore and Conservation Area Management Plan prior to finalisation of the ODP; and c) the potential for a reduction in the amount of Banksia woodland that would be cleared as a result of possible limitations imposed on the size of the marina development; <p>it is the EPA's opinion that the proposed amendment will meet the EPA's objective to maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities, provided that prior to finalisation of the Outline Development Plan, the boundaries of areas to be set aside for conservation, including the foreshore reserve area, shall be determined to the requirements of the EPA on advice from the DEP, PIMA, CALM and the Shire of Murray.</p> <p>An area of remnant vegetation of no less than that which is depicted in the ODP (Bowman Bishaw Gorham, 1997) shall be retained for conservation. In defining the boundary of the conservation areas, the following biophysical criteria should be taken into consideration: vegetation, hydrology, soil type, geology, topography, foreshore function, habitat, climatic variability, land use pressure, archaeological and ethnographic sites.</p>
Declared Rare and Priority Flora	The amendment area and all conservation reserves directly adjacent to the amendment area.	Protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950.	<p>It is considered that the flora and vegetation survey was inadequate in terms of scope, duration and timing. The inappropriateness of the timing of the flora survey is well illustrated by the fact that 13 of the 21 DRF and Priority Flora listed from CALM's database as being potentially detected in the area, would not have been evident at the time of survey.</p> <p>The majority of the areas of remnant vegetation, however, are proposed to be retained in reserves, public open space, or private conservation areas.</p>	<p>Having particular regard to:</p> <ul style="list-style-type: none"> a) the proposed retention of the majority of remnant vegetation; and b) the provision contained in the proposed amendment which requires the preparation of a Foreshore and Conservation Area Management Plan prior to finalisation of the ODP; <p>it is the EPA's opinion that the proposed amendment will meet the EPA's objective to protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950 providing that a Declared Rare Flora and Priority Flora survey will be conducted at an appropriate time of areas that are proposed to be cleared as a result of development.</p>

Fauna - impact of proposed development on fauna and habitat	The habitat areas of the trans-equatorial migratory waders within Australia, including the amendment area and conservation reserves directly adjacent to the amendment area, the Peel-Harvey estuary and Lakes McLarty and Mealup.	Maintain the abundance, species diversity and geographical distribution of terrestrial fauna and fauna habitat.	<p>It is inevitable that some impact will result from development adjacent to a wetland, both in the form of construction impacts and ongoing impacts. The response to submissions argues that the planning design for the Point Grey project minimises development, construction and ongoing impacts through the location of development nodes as far away as possible from significant waterbird habitat.</p> <p>The development of a boating facility on the western side of the peninsula will cause some disturbance to waterbirds on this shoreline, during both construction and operational phases of the facility. The proposed development will result in both direct and indirect, immediate and ongoing impacts on the waterbirds in Robert Bay. It is felt that these impacts can be minimised through implementation of certain measures.</p> <p>The Shire of Murray has agreed that prior to subdivision, a Waterbird Monitoring Plan and a Construction Management Plan will be prepared.</p>	<p>Having particular regard to:</p> <ol style="list-style-type: none"> the preparation and implementation of a Waterbird Monitoring Plan and a Construction Management Plan prior to finalisation of subdivision; the recommendation to utilise measures to reduce construction and ongoing impacts on waterbirds; and the preparation and implementation of a Foreshore and Conservation Area Management Plan; <p>it is the EPA's opinion that the proposed amendment will meet the EPA's objective to maintain the abundance, species diversity and geographical distribution of terrestrial fauna, provided that at least two years data is obtained on the use of the area likely to be impacted by waterbirds protected under JAMBA and CAMBA agreements prior to finalisation of development application for the marina.</p>
Wetlands	The Swan Coastal Plain	Maintain the integrity, functions and environmental values of wetlands.	<p>The most significant impacts threatening the nearby Ramsar wetlands, Lake Mealup and Lake McLarty, are potential indirect impacts to water levels caused by groundwater drawdown from the use of groundwater within the development, and a potential change in the quality of surface water and groundwater inputs to the wetlands.</p> <p>The site is located downgradient of both surface and groundwater flow of Lake Mealup and Lake McLarty. This, in combination with the very high phosphorus retention capacity of the Deep Spearwood Soils west of the wetlands should result in no nutrient transport to the lakes (Response to submissions, BBG, 1998).</p> <p>Advice from WRC (correspondence dated 28 April 1998) suggests that Lake Mealup and Lake McLarty are not likely to be significantly affected by pumping from the nominated production interval.</p>	<p>Having particular regard to:</p> <ol style="list-style-type: none"> advice from WRC suggesting that there should be minimal indirect impacts to water levels in nearby Ramsar wetlands caused by groundwater drawdown from the supply of groundwater to the development; and Lake Mealup and McLarty being located upgradient of groundwater and surface water flows from the development and the high phosphorus retention capacity of the soil of the surrounding area; <p>it is the EPA's opinion that the proposed amendment will meet the EPA's objectives to maintain the integrity, functions and environmental values of wetlands.</p>
Estuarine fauna and vegetation habitat	The Peel-Harvey Estuary.	Maintain the ecological function, abundance, species diversity and geographic distribution of seagrasses.	<p>The overall impact of the proposed marina is unacceptable in terms of loss of significant foreshore vegetation, the breach in the vegetation corridor, loss of seagrass and estuarine environment, and impact of dredging on the environment.</p> <p>The DEP supports the recommendation of PIMA that the proposed scale of the marina is not acceptable, but that a boating facility in the general location identified in the environmental review may be appropriate.</p> <p>The EPA considers that it is unable to assess the issue of the marina at this time due to a lack of information. As the EPA is unable to assess the proposed development at this time, the development application for the marina should be referred to the EPA under Section 38 of the Act when finalised. Further information considered critical to the assessment is the utilisation of the proposed site by JAMBA and CAMBA waterbird species as identified above.</p> <p>The scale and design of the boating facility should be finalised in consultation with PIMA, WRC, and the DEP. Consideration of cumulative impacts and nature of proposed land use is imperative. Access to the sandy beach must be tightly controlled to reduce impact on foreshore vegetation and the impact of the proposed Waterfront tourist village should also be considered.</p>	<p>The EPA considers that it is unable to assess the issue of the marina at this time due to a lack of scientific and technical information. The EPA will, however, offer the following comments.</p> <p>The marina should be developed and constructed only within the amendment area, excluding areas of remnant vegetation. Access to the estuary should be limited to an entrance channel of less than 100 metres in width. Dredging and reclamation of the estuary, other than dredging for an entrance channel to the land-based marina should not be allowed.</p> <p>Prior to finalisation of the development application for the marina, a Boating Facility Management Plan should be prepared and included in the referral documentation submitted for assessment to the EPA. The Plan should address:</p> <ol style="list-style-type: none"> design standards that meet EPA objectives for water quality and beneficial use protection in estuarine environments; the patterns of bird usage of the proposed site, particularly by waterbirds protected under JAMBA and CAMBA agreements, based on at least two years data; a Dredge Spoil Disposal Management Plan to include control of dewatering fluids and dredge spoil; a Water and Sediment Quality Monitoring Plan; and a maintenance and management agreement for the boating facility and entrance channel.

Cave - impact of proposed development	The amendment area	Maintain the environmental, scientific, cultural and recreational values of cave landforms.	<p>A cave is present within the amendment area. The cave, named Avalon Cave, was discovered in 1959 by Lex Bastion. The cave is considered to be the most spectacular formation cave between Yancheep and Cape Naturaliste. It contains stalactites, stalagmites, flow pools and other forms of decoration.</p> <p>The cave is thought to extend about 90m in length and is about 20m at its widest point. The cave will fit into a rectangular area of about 90m by 35m, in a south easterly direction from the entrance mouth.</p> <p>The land owner has agreed that the cave should be protected. The area above the cave should be utilised as public open space and the cave should be secured from uncontrolled access by the installation of a fence and locked gate.</p>	<p>Having particular regard to:</p> <ul style="list-style-type: none"> a) the agreement of the land owner to protect the cave; and b) lack of protection and safety measures proposed in the environmental review; <p>it is the EPA's opinion that the preparation of a Cave Management Plan is required prior to finalisation of the ODP to ensure the EPA's objective for caves may be met.</p>
Pollution Management				
Estuarine water quality	The Peel-Harvey Estuary to the high water mark.	Meet environmental quality objectives for the Peel Inlet-Harvey Estuary specified in the Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1992 and water quality guidelines specified in EPA Bulletin 711 for the protection of aquatic ecosystems.	<p>Onsite disposal of effluent should not result in a discharge of phosphorus to the estuary in excess of requirements as stipulated in the Environmental Protection (Peel Inlet-Harvey Estuary) Policy, 1992 for a minimum of 70-80 years (Gerritse, 1998). After this time, the phosphorus leaching through the soil profile will breakthrough to the water table, seeping into the estuary.</p> <p>The Southern Metropolitan Coastal Waters Study (DEP, 1996) recommends that environmental protection policies and integrated catchment management strategies for the catchment of the Peel-Harvey Estuary should incorporate the objective of minimising nutrient inputs to the coastal waters.</p> <p>The EPA considered the issue of nitrogen input to the Peel-Harvey estuary from residential development at Amarillo Farm, Karnup (Bulletin 862). In that assessment, the EPA recommended that the proponent ensure that the nitrogen load from the property is reduced as far as is practicable (EPA, 1997).</p> <p>Total nitrogen application for the site will substantially increase post-development in comparison to the current level of nitrogen application ie from between 6.3 and 16.5 tonnes per annum to 43 tonnes per annum.</p> <p>The majority of the nitrogen load is attributed to the golf course, public open space, recreational areas and the traditional neighbourhood village, (Bowman Bishaw Gorham, 1998) rather than the treefarm area and the disposal of treated effluent.</p>	<p>Having particular regard to:</p> <ul style="list-style-type: none"> a) the proposed on-site disposal of all effluent, including sewage; b) the nitrogen limiting capacity of the Harvey Estuary; c) the adverse effects of nitrogen in nearshore coastal waters; d) the increase in nitrogen load and nitrogen export as a result of the proposed development; and e) the scheme provision contained in the proposed amendment which requires the preparation of a Nutrient and Irrigation Management Plan prior to development; <p>it is the EPA's opinion that if it can be demonstrated that no nett increase in nitrogen export will result from the development, the proposed amendment can be managed to meet the EPA's objective for estuarine water quality as outlined above.</p>
Social Surroundings				
Mosquitoes	The amendment area.	Control the breeding of mosquitoes without adversely affecting other flora and fauna.	<p>The issue of mosquitos is a regional problem. The land owner has agreed to manage mosquitos within the amendment area, however, cannot be responsible for mosquitos that breed elsewhere and travel to the peninsula.</p> <p>The EPA considered the impact of mosquitoes on the proposed residential subdivision at Amarillo, Karnup Environment (EPA, 1997). In that assessment (Bulletin 862) the EPA noted that there is a need for the State Government to consider and implement off-site measures to adequately control mosquito numbers so that the EPA's objectives could be met.</p> <p>The EPA reiterates this advice in relation to the proposed development of Pt Grey. The risk to human health posed by mosquitoes is a regional issue beyond the scope of individual proposals by private landowners and requires a strategic approach by the State Government.</p>	<p>Having particular regard to:</p> <ul style="list-style-type: none"> a) the fact that the risk to human health from mosquitos is a regional issue; and b) the recommendation in the environmental review that no additional mosquito breeding areas be created; <p>it is the EPA's opinion that the proposed amendment will meet the EPA's objectives to control the breeding of mosquitoes without adversely affecting other flora and fauna.</p> <p>The EPA recommends, however, that an environmental condition should be imposed requiring measures to be put in place to ensure that prospective purchasers of land within the amendment area are advised of the existence of a health risk due to mosquitoes.</p>

Other factors				
Environmental performance - audit of implementation	The amendment area	To ensure that through appropriate auditing, no significant environmental harm or long term loss of environmental values will occur.	<p>The performance review or auditing of the environmental conditions shall occur as part of the review of TPS No. 4 by the Shire of Murray.</p> <p>Prior to the subdivision, the developer should provide adequate baseline data related to the environmental factors identified in Section 3 of this report so that the implementation of the amendment can be monitored. This baseline audit statement is required to provide a benchmark for future audits.</p> <p>The review of the environmental conditions should be made available to the DEP.</p>	<p>The EPA recommends that an environmental condition be imposed requiring:</p> <ul style="list-style-type: none"> • a performance review of the Special Rural subdivision of Lot 3 to determine whether it is meeting the environmental objectives; and • the Shire of Murray to review the performance of the environmental conditions imposed on the Special Rural subdivision of Lot 3 in the review of TPS No. 4 under Section 7AA of the Town planning and Development Act.

3.2 Components of the amendment of environmental significance

In the EPA's opinion, the following environmental issues and components of the scheme amendment are considered to have environmental significance and consequently require detailed evaluation in this report:

- a) Waterbirds - potential direct and indirect impacts from development;
- b) Marina - loss of estuarine habitat, seagrass, remnant vegetation and scale of dredging;
- c) Loss of nutrients, primarily nitrogen and phosphorus to the Peel-Harvey Estuary - resulting from development;
- d) Water supply - potential for drawdown in the Leederville aquifer effecting nearby Ramsar Lake Mealup and Lake McLarty;
- e) Foreshore - significance of remnant vegetation and proposed management of impacts of development;
- f) Avalon cave - public safety and management;
- g) Mosquitos - public amenity; and
- h) Environmental performance - audit of implementation.

The environmental significance of the above components of the amendment and their assessment is discussed in Sections 3.3 to 3.10 of this report. The description of each component shows how it relates to the scheme amendment and outlines the relevant proposed scheme provisions. The assessment of each component, combined with the consideration of the environmental factors relevant to each component, is where the EPA considers if the proposed amendment can be managed to meet the environmental objectives set for each factor. The relationship between the components or environmental issues that are relevant to the amendment and the environmental factors determined to be relevant to each component is shown in Table 4 below.

Table 4. Matrix of environmental factors and components of the amendment

Factor Component	Vegetation	DRF	Fauna	Wetlands	Estuarine vegetation & fauna habitat	Cave	Estuarine water quality	Mosquitoes
Waterbirds	☆		☆		☆			
Marina	☆		☆		☆			
Nutrients							☆	
Water supply				☆				
Foreshore	☆	☆	☆		☆			
Avalon cave						☆		
Mosquitoes								☆

3.3 Waterbirds - potential direct and indirect impacts from development.

Description

The significance of the Peel-Harvey Estuary as a waterbird habitat has been recognised by its nomination by the Government of Western Australia for inclusion on the list of wetlands of international importance at the Ramsar Convention in 1990 (CALM, 1990). The Ramsar wetland area extends to the high water mark of the estuary and includes nearby Lake Mealup and Lake McLarty. In terms of total numbers, Peel Inlet and Harvey Estuary comprise the most important area for waterbirds in south-western Australia (CALM, 1990).

In addition to this, the intertidal flats in Robert Bay, on the eastern side of the development, provide feeding and loafing habitat for trans-equatorial migratory waterbirds, many of which are protected under international agreements with China and Japan (Japan - Australia Migratory Bird Agreement (JAMBA) & China - Australia Migratory Bird Agreement (CAMBA)).

Concern was expressed in submissions with regard to potential direct and indirect impacts on waterbirds arising from the proposed development. For example, the intertidal flats in Robert Bay directly abut an area proposed for rural-residential development. It was observed that there was no discussion of the management of impacts on the waterbirds from pedestrians, domestic pets, off-road vehicles or boats in the environmental review.

It is the opinion of Department of Conservation and Land Management (CALM) that the proponent has not supplied sufficient data to determine whether the area proposed for the marina is a significant area of waterbird habitat. CALM requests at least two years data on the use of the area likely to be impacted by waterbirds protected under JAMBA and CAMBA prior to finalisation of the marina design.

The fauna study of 20 hours without trapping was considered to be too brief to be called adequate. Research at the nearby Goodale Sanctuary south-east of Point Grey and at Lake Mealup suggests that the Point Grey fauna list is far from complete.

Proposed scheme provisions:

Waterbird monitoring

The amendment, as advertised, proposed that "Prior to construction, a Waterbird Monitoring Plan shall be prepared for those areas adjacent to important waterbird habitat in consultation with the EPA on advice from CALM and PIMA" (Bowman Bishaw Gorham, 1997).

Construction management

The amendment, as advertised, proposed that "Prior to construction, a Construction Management Plan shall be prepared for each stage in consultation with the EPA on advice from the Shire of Murray. The Plan will address:

- i) the minimisation of clearing and vegetation disturbance;
- ii) the protection of foreshore buffers;
- iii) the control and monitoring of dust noise and smoke; and
- iv) the incorporation of environmental protection specifications in all construction-related contracts" (Bowman Bishaw Gorham, 1997).

Assessment

The areas considered for the assessment of the environmental significance of this component and the factors relevant to the component are the habitat areas of the trans-equatorial migratory waders within Australia, especially the amendment area and conservation reserves directly adjacent to the amendment area, the Peel-Harvey Estuary, Lake McLarty and Lake Mealup.

The Point Grey area has both national and international significance as waterbird habitat and consequently it must be demonstrated that impacts on both the waterbirds and their habitat resulting from the proposed development can be adequately managed. The response to submissions notes, however, that to date, very little reliable data is available on the impact of resort and residential developments on waterbirds. Most of the available information is anecdotal, subjective or speculative - as opposed to the "hard" data gathered from systematic, long-term surveys (Bowman Bishaw Gorham, 1998a).

The proposed amendment will result in both direct and indirect, immediate and ongoing impacts to waterbirds. The development of a boating facility (marina) on the western side of the peninsula will cause some disturbance to waterbirds on this shoreline, during both construction and operational phases of the facility. The amendment also proposes rural-residential development adjacent to the intertidal flats in Robert Bay on the eastern side of the peninsula, which will result in further impacts to waterbirds.

The response to submissions argues that the planning design for the Point Grey project minimises development, construction and ongoing impacts on waterbirds through the location of development nodes as far away as possible from significant waterbird habitat.

Impacts to waterbirds can be minimised through the implementation of certain measures. The DEP recommends that the following measures are considered when formulating the Waterbird Management Plan:

- a) use of sight screens where appropriate to minimise visual impact during construction adjacent to important waterbird habitat;
- b) limitation of intrusive human access to sensitive portions of the foreshore, enforced by fencing, consequently creating protected refuge areas;
- c) control of vehicles by physical barriers;
- d) public education to develop increased awareness of the sensitivity of the area;
- e) adequate sign posting to define exercise areas for horses and dogs;
- f) control of feral animals where practicable; and
- g) modification and improvement of conservation methods.

Relevant environmental factors

The following environmental factors were identified from the consideration and assessment of the potential for direct and indirect impacts to waterbirds and their habitat resulting from the proposed development as discussed above.

Relevant factor	EPA objective
Vegetation	maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities
Fauna	maintain the abundance, species diversity and geographical distribution of terrestrial fauna
Estuarine vegetation and fauna habitat	maintain the integrity, functions and environmental values of estuaries

Having particular regard to:

- a) the preparation and implementation of a Waterbird Monitoring Plan and a Construction Management Plan prior to finalisation of subdivision;
- b) the recommendation to utilise measures as stated above to reduce construction and ongoing impacts on waterbirds;
- c) the preparation and implementation of a Foreshore and Conservation Area Management Plan;

it is the EPA's opinion that the proposed amendment is capable of meeting the EPA's objectives for vegetation, fauna and estuarine vegetation and fauna habitat, provided that, prior to finalisation of development application for the marina:

- data on waterbird use of the area is obtained for two years;
- the ODP is modified if necessary to ensure waterbird use of the area is not compromised, particularly for species protected under JAMBA and CAMBA agreements.

The above requirements are explained further in the following section.

EPA recommendations on environmental conditions

It is acknowledged that the environmental review has proposed a number of scheme provisions which could, if implemented, manage the environmental impacts resulting from the proposed development. The EPA considers that it is necessary, however, to impose a number of conditions to ensure that appropriate planning mechanisms will be implemented into the scheme amendment prior to gazettal. It is recommended that the following environmental conditions should be imposed:

- (i) Prior to commencement of construction within the amendment area, a Waterbird Monitoring Plan shall be prepared for those areas adjacent to important waterbird habitat to the requirements of the EPA on advice from the DEP, Peel Inlet Management Authority (PIMA), CALM and the Shire of Murray.

This Plan shall address:

- a) bird utilisation of the proposal area, including patterns of roosting, nesting, feeding, and mating, in particular for the area proposed for development of the marina. Utilisation information should be based on observations over at least two summer visiting periods;
- b) modification of the proposal, if necessary, to ensure waterbird usage of the area is not compromised;
- c) potential impacts of the project on bird life during the construction stage;
- d) management of these impacts on waterbirds during construction;
- e) management of ongoing impacts on waterbirds from pedestrians, domestic pets, off-road vehicles and boats, including but not limited to the following measures:
 - limitation of intrusive human access to sensitive portions of the foreshore;
 - control of vehicles by physical barriers;
 - public education to develop increased awareness of the sensitivity of an area;
 - adequate sign posting to define exercise areas for horses and dogs;
 - control of feral animals to the extent practicable; and,
 - modification and improvement of conservation practices.

- (ii) Prior to finalisation of the ODP a Construction Management Plan shall be prepared for the amendment area, to the requirements of the EPA on advice from the DEP and the Shire of Murray.

This Plan shall address:

- a) the minimisation of clearing and vegetation disturbance;
- b) the protection of foreshore buffers;
- c) the control and monitoring of dust, noise and smoke;
- d) the prevention and control of the spread of dieback; and
- e) the incorporation of environmental protection specifications in all construction-related contracts.

3.4 Marina - loss of estuarine habitat, seagrass, remnant vegetation and scale of dredging.

Description

Point Grey forms a physical division between the Harvey Estuary, which lies on the site's western shore, and the Peel Inlet, which lies on the site's eastern shore (Figure 1). The Peel-Harvey Estuary supports a highly productive and diverse ecosystem which has been significantly affected by human activities within the estuary and its catchment.

A sailing club for shallow-draft yachts is proposed to be located on the north-eastern shore of the peninsula (Figure 3). The development will include a club house, apartment style accommodation, a sandy beach and a shallow draft launching ramp. A channel may need to be dredged to allow access to the sailing club.

A marina is also proposed for a site on the promontory on the north-west flank of the Point Grey peninsula (Figure 3). The design of the marina has been altered from that proposed in the environmental review (Bowman Bishaw Gorham, 1997) due to comments made during the submission period. The modified marina design (Figure 4) encompasses an area of estuarine habitat of 6ha, which includes the marina basin and pens, created through the excavation of around 5ha from the shoreline. The groins of the marina are proposed to extend about 200 metres into the estuary.

The marina development is likely to require the dredging of a channel to allow access to the Dawesville Channel and ocean. The excavated dredge spoil would be pumped onto or adjacent to land to be developed as part of the marina precinct.

The area of the shoreline and estuary bed that is proposed to be dredged for the construction of the marina is considered to be highly sensitive and valuable in terms of providing habitat and feeding grounds for the low order marine and estuarine creatures which inhabit the Peel-Harvey Estuary.

The estuarine margins are the most productive areas of an estuary and are important for conserving bio-diversity. The estuarine margins at Point Grey have improved in health since the construction of the Dawesville Channel. It was noted that a "Biological survey of the sub-tidal areas adjacent to the Point Grey land and in the vicinity of the proposed marina site has found that the seagrass *Halophila* is re-establishing very successfully...in response to improved water quality." (Bowman, 1998).

The proposed marina site also contains a significant area of remnant vegetation, primarily Banksia woodland, in very good condition. The area proposed for development of the marina

and associated structures contains *Melaleuca huegelii* and *M. Acerosa* Open Heath which may represent floristic community type 26a (shrublands of limestone ridges) or 26b (Woodlands and mallees on limestone) (Keighery, 1998). The limestone floristic community type 26a has been recommended as a “critically threatened community” (Keighery, 1998). The vegetation is between 120 to 200m in width and this represents a large portion of uncleared, good quality vegetation in the amendment area which has been largely cleared for farming. The site of the proposed marina has been nominated for conservation in the recently released IPRSP (WAPC, 1997) and is proposed to be included in the Peel Regional Park (PRP) (WAPC, 1997). The foreshore vegetation also provides a valuable corridor for fauna, linking the northern tip of Point Grey with the foreshore areas along the eastern side of the Harvey Estuary and Reserve 27528.

The modified marina design requires that around 8ha of Banksia woodland and 6 ha open heath be cleared to allow construction of the marina and associated developments.

The “Boating facilities study for the Peel Region” (1996) by the Department of Transport (DoT) identified the need for a Level 5 boating facility within the Point Grey area. This type of facility is a regional facility and should consist of boat launching ramps and finger jetties. A boat harbour or marina was not recommended for Point Grey at this time (DoT, 1996).

Agency and public comments

In their submission, PIMA and Water and Rivers Commission (WRC) raised concerns about the scale of the proposed marina development. It was felt that the overall impact of the marina development was unacceptable in terms of loss of significant foreshore vegetation, the breach in the vegetation corridor, loss of seagrass and estuarine environment, and impact of dredging on the environment.

The WRC and PIMA consider that “the only larger boating facility that could be developed would have to be land based, and at a scale which would minimise impacts on the Foreshore Reserve. Such a scale would mean that the only breach of the foreshore reserve would be for an entrance channel into the marina, similar to those at Mandurah Quay and Port Mandurah” (PIMA, 1998).

Foreshore reserves should only be broken by narrow openings if they are to function effectively as wildlife corridors. It is considered by PIMA that both the large breach that would result from development of the marina and the proposed ten metre wide access corridors linking the urban areas with the foreshore are unacceptable (PIMA, 1998).

The WRC and PIMA also recommended that dredging and reclamation of the estuary, other than dredging for an entrance channel to the land-based marina, should not be permitted.

Since the opening of the Dawesville Channel, the water quality in the estuary has improved so significantly that an almost pure marine habitat has resulted. As a consequence of the introduction of sea water, seagrass and beach regeneration are occurring through natural processes. This natural regeneration of seagrass is considered to be rare and consequently PIMA and WRC consider that it should not be disturbed.

The DoT noted that depth requirements for the proposed sailing club would be approximately 0.5m below low water to allow navigation by outboard powered rescue craft. As the low water mark (LWM) is approximately 100m offshore, the rescue boat channel from the launching ramp needs to extend about 50m offshore of the LWM, a total distance of 150m. It is considered that approximately 2000m² surface area would need to be deepened with a total volume of approximately 750m³ of spoil removed. The submission by DoT observed that the presumed power boat depth would be some 250m offshore and consequently the dredging of the channel

for powered craft may involve some 3 000 square metres of surface and 2 000 cubic metres of spoil.

Proposed scheme provisions: Marina management

The amendment, as advertised, proposed that “Prior to construction of the Marina, a Marina Management Plan shall be prepared in consultation with PIMA, DoT and the Shire of Murray. The Plan shall incorporate:

- i) design standards to meet EPA objectives for water quality and beneficial use protection;
- ii) a Dredge Spoil Disposal Management Plan to include disposal of dewatering fluids and dredge spoil and construction of two offshore islands to create replacement habitat for water birds;
- iii) a Water and Sediment Quality Monitoring Plan; and
- iv) a maintenance and management agreement for the marina and entrance channel” (Bowman Bishaw Gorham, 1997)

Assessment

The EPA considers that it is unable to assess the acceptability of the marina at this time due to a number of reasons. PIMA and WRC have raised strong objections to both the original and modified marina designs. It is considered that insufficient scientific and/or technical information has been provided to demonstrate that the proposed marina (or boating facility) will not harm the ecology of the locality. Further information required includes the significance of the area proposed for the marina as habitat for waterbirds protected under JAMBA and CAMBA as discussed in section 3.3 above; the condition of the western foreshore of Point Grey and whether the coastline is accreting in this area; the finalised design of the marina; and, the proposed frequency and scale of any dredging of the estuary.

The EPA will, however, offer the following comments:

It is the opinion of the EPA that the scale of the proposed and revised marina design (Figure 4) may significantly impact the integrity and function of the Peel-Harvey Estuary in the area of the Point Grey peninsula.

The EPA notes the recommendation of PIMA that the proposed scale of the marina is not acceptable, but that a boating facility in the general location identified in the environmental review may be appropriate. PIMA and WRC recommend that the only boating facility that may be developed should be restricted to land within the amendment area ie. a land-based marina. The scale of this facility should be such that impacts on the estuary and foreshore would be minimal.

Relevant environmental factors and objectives

The following environmental factors were identified from the consideration and assessment of the marina as discussed above.

Relevant factor	EPA objective
Vegetation	maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities
Fauna	maintain the abundance, species diversity and geographical distribution of terrestrial fauna
Estuarine vegetation and fauna habitat	maintain the integrity, functions and environmental values of estuaries

EPA recommendations

Under Section 48J (3) of the *Environmental Protection Act 1986*, “if the responsible authority determines...that one or more of the environmental issues raised by the proposal was or were not assessed in any assessment of the assessed scheme under this Division (Division IV)...the responsible authority shall in its capacity as a decision-making authority refer the proposal to the Authority under Section 38.”

There is also a requirement under Section 38(3)(b) the Act that “the Authority shall, if...in the case of a proposal under an assessed scheme, the Authority did not, when it assessed the scheme under Division 3 of this Part, have sufficient scientific or technical information to enable it to assess the environmental issues raised by that proposal...require a decision-making authority or proponent to refer in writing the proposal to the Authority...” As the EPA has not assessed the proposed development at this time due to a lack of scientific and technical information, the development application for the marina should be referred to the EPA under Section 38 of the Act when finalised.

EPA comments on marina design

It is recommended by the EPA, that when finalising the design proposal for a marina or boating facility at Point Grey, the following suggestions should be given consideration.

The scale and design of the boating facility should be finalised in consultation with PIMA, WRC, and the DEP. Consideration of cumulative impacts and nature of proposed land use is imperative. Access to the sandy beach must be tightly controlled to reduce impact on foreshore vegetation and the impact of the proposed Waterfront tourist village should also be considered.

The boating facility should be limited to a land-based marina. The only breach of the foreshore reserve should be for an entrance channel into the marina of less than 100 metres in width and contained fully within Lot 1132, in the area defined by the northern boundary of Lot 1132 and 300m south of this boundary.

Dredging and reclamation of the estuary, other than dredging for an entrance channel to the land-based marina should not be allowed.

Prior to finalisation of the development application for the boating facility, a Boating Facility Management Plan should be prepared and included in the referral documentation submitted for assessment to the EPA.

The Plan should address:

- a) design standards that meet EPA objectives for water quality and beneficial use protection in estuarine environments;
- b) the patterns of bird usage of the proposed site, particularly by waterbirds protected under JAMBA and CAMBA agreements, based on at least two years data;
- c) the condition of the western foreshore of Point Grey and whether the coastline is actually accreting in this area;
- d) a Dredge Spoil Disposal Management Plan to include control of dewatering fluids and dredge spoil;
- e) a Water and Sediment Quality Monitoring Plan; and
- f) a maintenance and management agreement for the boating facility and entrance channel.

3.5 Loss of nutrients, primarily nitrogen and phosphorus, to the Peel-Harvey Estuary - resulting from development.

Description

All effluent, including sewage, from the proposed Point Grey development will be collected, treated and disposed of on-site. Consequently, nutrients may be transferred to the estuary as a result of activities on site, through infiltration of the disposed effluent to the superficial aquifer and discharge of this groundwater to the estuary.

The majority of the site will be serviced by a reticulated sewerage network, culminating in a tertiary treatment plant incorporating Biological Nutrient Removal (BNR) technology. The proposed final effluent concentration will be 1 part per million (ppm) total phosphorus (P) and 5 ppm total nitrogen (N).

Treated effluent will initially be used to irrigate the eucalypt woodlot until such time as the volume of effluent is sufficient to irrigate the golf course. Disposal of wastewater in winter will be to the woodlot.

The Peel-Harvey Estuary has historically been subjected to a high level of nutrient input from runoff of surface water from its catchment and the flow of superficial groundwater. Consequently, the Peel-Harvey Estuary is eutrophic and has suffered severe algal blooms since the 1970's. The algal blooms are caused mainly by accumulation of particulate phosphorus in sediments and the resuspension of sediments, which greatly increases the availability of phosphorus to algae (Gerritse, 1998, unpublished).

In 1987, the EPA rejected an earlier development proposal for the Point Grey peninsula (Bulletin 306, EPA, 1988). The development was seen to have the potential to contribute phosphorus and nitrogen into the estuarine ecosystem through the disposal of treated sewage effluent and septic tank waste, the application of fertilisers on domestic lawns and gardens, and the leaching of agricultural fertiliser already in the soil. The EPA considered that reduced environmental amenity would have been experienced by Point Grey residents if the proposal progressed, including significant problems associated with macroalgal accumulations along the foreshores, contributing to odour and beach fouling.

In 1994, the Dawesville Channel was opened, creating increased tidal exchange between the Peel-Harvey Estuary and the ocean. The increase in flow of sea water into the estuary aids in the flushing of nutrients from the estuary and increases the salinity of the estuary water. This increased salinity inhibits the growth of blue-green algae. The long term benefits of the Channel have yet to be determined, however, water quality problems have declined since its opening (Rose, 1995, as cited in Bowman Bishaw Gorham 1997).

Concerns were raised in submissions about the accuracy of the assessment of potential nutrient contributions (both phosphorus and nitrogen) to the estuary from the proposed development. It was noted that some issues required further consideration, including: variations in nutrient loading of the final effluent produced by the BNR plant; different options of disposal of effluent from the treatment plant; and various options of irrigation of the golf course, active recreation areas and landscaped areas including associated fertiliser, pesticide and insecticide applications.

Further concerns were raised with regard to the woodlot's capacity to absorb the volume of effluent proposed to be applied to the area without surface runoff or tree failure. The issue of winter storage to accommodate rainfall was also mentioned.

Proposed scheme provisions: Nutrient and irrigation management

The amendment, as advertised, proposed that "Prior to construction, a Nutrient and Irrigation Management Plan shall be prepared in consultation with the EPA, in order to limit phosphorus export from the site to the Estuary so as to comply with the phosphorus loading targets in the Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1992.

"The preparation of the Plan may be undertaken as three independent studies dependent upon and relevant to the level of development proposed and will address:

- i) irrigation and nutrient management of the Golf Course and other landscaped areas;
- ii) management practices and nutrient-related objectives for the on-site treatment and disposal of sewage; and
- iii) ongoing monitoring and reporting of phosphorus concentrations and movements in the groundwater beneath the site" (Bowman Bishaw Gorham, 1997).

Assessment

The area considered for the assessment of the environmental significance of this component and the factors relevant to the component is the Peel-Harvey Estuary and nearby coastal waters.

The DEP commissioned an independent review of the phosphorus and nitrogen export models (Gerritse, 1998). This review revealed that the on-site disposal of effluent would not result in a discharge of phosphorus to the estuary in excess of requirements stipulated in the Environmental Protection (Peel Inlet-Harvey Estuary) Policy, 1992. The worst possible case scenario for a depth to groundwater of 2m results in travel times for phosphate (Gerritse, 1996) of about 70 to 80 years for the tourist, foreshore and effluent disposal areas (Gerritse, 1998). Consequently it would take at least 70 to 80 years for phosphorus from the proposed development to leach through to the groundwater and an even longer period of time to reach the estuary.

Nitrogen inputs at Point Grey will move rapidly through the soil to the estuary and consequently need to be controlled at source. The estuary has more than likely become nitrogen limited for algal growth as a result of intensive flushing with sea water entering through the Dawesville Channel. Consequently, local discharges of nitrogen along the shoreline at Point Grey may trigger algal blooms (Thompson & Hosja, 1996).

The Peel-Harvey Estuary EPP (EPA, 1992) does not provide for any specific limitation of nitrogen loadings to the estuary waters nor is any catchment target identified, however, the Minister for the Environment has requested that the EPA determine limits for nitrogen loadings in an update of the Environmental Protection (Peel Inlet-Harvey Estuary) Policy, 1992.

The EPA considered the issue of nitrogen input to the Peel-Harvey estuary from residential development at Amarillo Farm, Karnup, in its report to the Minister for the Environment (Bulletin 862) in June 1997 (EPA, 1997). In that assessment, the EPA recommended that the proponent ensure that the nitrogen load from the property is reduced as far as is practicable.

Elevated levels of nitrogen flowing out of the Peel-Harvey Estuary have also been identified as a problem in coastal waters, resulting with marked increases in phytoplankton populations (DEP, 1996). The Southern Metropolitan Coastal Waters Study (DEP, 1996) recommends that environmental protection policies and integrated catchment management strategies for the catchment of the Peel-Harvey Estuary should incorporate the objective of minimising nutrient inputs to the coastal waters.

The environmental review estimates that around 42 tonnes of N will be applied to the site each year at full development. The environmental review states that between 4 and 10% of this N

may leach to the groundwater and consequently an export figure of around 4.2 tonnes/annum is established.

However, the independent review found that assuming no vegetation (grass clippings etc) to be exported, a transmission rate of nitrogen to groundwater of *at least 10%* may be assumed (oxic soils, oxic groundwater), resulting in groundwater concentrations (assuming no denitrification of groundwater) ranging from <0.5 mg/L N - NO₃ under low density residential areas to about 1 mg/L under the neighbourhood village and waste water treatment area and up to 5mg/L under the golf course (Gerritse, 1998).

It is estimated that total nitrogen application for the site will substantially increase post-development in comparison to the current level of nitrogen application. The predicted nitrogen load at full development is 42 tonnes per annum (Bowman Bishaw Gorham, 1997). This is an increase in magnitude of between three and seven times, as current nitrogen load is estimated at 6.3 to 16.5 tonnes per annum (Gerritse, 1998). This increase in nitrogen loads is inconsistent with Recommendation 1 of the Southern Metropolitan Coastal Waters Study (DEP, 1996), which has the objective of minimising nutrient inputs to marine waters within the catchments of the Swan-Canning and Peel-Harvey Estuary.

The majority of the nitrogen load, however, is attributed to the golf course, public open space, recreational areas and the traditional neighbourhood village, (Bowman Bishaw Gorham, 1998a) rather than the treefarm area and the disposal of treated effluent.

It is the position of the EPA that there should be no nett increase in nitrogen export into the Peel-Harvey Estuary from development within the estuary's catchment. The environment in the estuary and nearshore coastal waters is considered to be highly sensitive, despite reductions in water quality problems since the opening of the Dawesville Channel.

Relevant environmental factors

The following environmental factor was identified from the consideration and assessment of the issue of loss of nutrients to the estuary as discussed above.

Relevant factor	EPA objective
Estuarine water quality	meet environmental quality objectives for the Peel Inlet-Harvey Estuary specified in the Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1992, Recommendation 1 of the Southern Metropolitan Coastal Waters Study and water quality guidelines specified in EPA Bulletin 711 for the protection of aquatic ecosystems.

Having particular regard to:

- a) the proposed on-site disposal of all effluent, including sewage;
- b) the nitrogen limiting capacity of the Harvey Estuary;
- c) the adverse effects of nitrogen in nearshore coastal waters;
- d) the predicted increase in nitrogen load and nitrogen export as a result of the proposed development; and
- e) the scheme provision contained in the proposed amendment which requires the preparation of a Nutrient and Irrigation Management Plan prior to development;

it is the EPA's opinion that if it can be demonstrated that no nett increase in nitrogen export will result from the development, the proposed amendment can be managed to meet the EPA's objective for estuarine water quality as outlined above.

EPA recommendations on environmental conditions

It is recommended that a condition be imposed that, prior to finalisation of the ODP, the development will be modified to ensure that there will be no nett increase in nitrogen export to the Peel-Harvey estuary as a result of development within the amendment area.

It is acknowledged that the environmental review has proposed a number of scheme provisions which could, if implemented, manage the environmental impacts resulting from the proposed development. The EPA considers that it is necessary, however, to impose a number of conditions to ensure that appropriate planning mechanisms will be implemented into the scheme amendment prior to gazettal. It is recommended that the following environmental conditions should be imposed:

- (i) The amendment area, with the exception of a small number of lots within the rural-residential development that have an area greater than 4 000m², shall be serviced by a reticulated sewer network, operating by gravity, vacuum sewers and/or pump stations. The design, construction and operation of the sewerage system should comply fully with relevant Office of Water Regulation and Health Department requirements.
- (ii) The reticulated sewerage network shall ultimately be serviced by a tertiary treatment plant, located at least 500m from sensitive land use areas, that will incorporate Biological Nutrient Removal to achieve maximum final treated effluent concentrations of 1 part per million total phosphorus and 5 parts per million total nitrogen.

Interim arrangements for the disposal of effluent involving secondary treatment will be subject to agreement from the Department of Environmental Protection, Office of Water Regulation and the Health Department, to the extent of the duration of operation of the treatment plant and the disposal of effluent.

- (iii) Conventional on-site effluent disposal systems that are installed on lots over 4 000m² shall not be located closer than 100m to any water source and shall have a minimum 2m vertical clearance to the highest known water table or bedrock. Effluent disposal systems that are of a type that minimise nutrient export shall not be located closer than 30m to a water source. This recommendation is consistent with the Peel-Harvey SPP No. 2 (WAPC, 1992).
- (iv) Prior to commencement of construction within the amendment area, a Nutrient and Irrigation Management Plan (NIMP) should be prepared to the requirements of the EPA on advice from the DEP, PIMA and WRC, in order to limit phosphorus and nitrogen export from the amendment area to the Peel-Harvey Estuary so as to comply with the Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1992 (EPA, 1992).

The Plan will address:

- irrigation and nutrient management of the Golf Course and other landscaped areas;
- management practices and nutrient-related objectives for the on-site treatment and disposal of sewage; and
- ongoing monitoring and reporting of phosphorus and nitrogen concentrations and movements in the groundwater beneath the site.

Results of the NIMP should be reported to relevant agencies annually during the construction phase of the sewage treatment plant and for five years after, and then at an interval determined by experience. Follow-up phosphorus leaching modelling will be carried out to confirm that phosphorus objectives for the Peel-Harvey Estuary can be met for the foreseeable future. The monitoring and remodelling programme will be detailed in the NIMP, and will be carried out in consultation with the EPA upon advice from the WRC.

- (v) Prior to finalisation of the ODP, base-line data identifying current export levels of nitrogen and phosphorus should be provided to the DEP. The export levels should be demonstrated to have resulted from rural activities currently carried out on site.
- (vi) Prior to finalisation of the ODP and in each annual report, it should be demonstrated that there is no nett increase in nitrogen and phosphorus export as a result of development within the amendment area.

3.6 Water supply - potential for drawdown in the Leederville aquifer effecting nearby Ramsar Lakes Mealup and McLarty.

Description

The amendment area is within 1km of Lake McLarty and Lake Mealup (Figure 2), both of which are recognised as wetlands of international importance under the Ramsar Convention (CALM, 1990). The amendment area directly abuts Conservation Reserve 4990 which also contains a significant wetland area.

Potable water for the development is proposed to be supplied through the abstraction of groundwater from the Leederville unconfined aquifer. Computer modelling utilising input from on-site bores has revealed that a sustainable water supply for at least 7 000 residents exists within the upper Leederville aquifer. The development is planned to be supplied with water in stages and it is expected that a total of six production and two stand-by bores will be required at full development.

At full development, the level in the Leederville aquifer is predicted to drop by 1.5m.

Concerns were raised in submissions that the Government may be in breach of the Ramsar Convention if the development was allowed to proceed. The Point Grey development was seen to threaten the integrity of Lake McLarty and Lake Mealup, which are Ramsar-listed wetlands (as is the Peel-Harvey Estuary).

The responsible authority was required to address the potential impacts of the development on Lake Mealup and Lake McLarty as stated in the EPA's Environmental Review Instructions. Concerns were raised in submissions that this issue was not adequately addressed. In particular, the assumption that the expected drawdown of the Leederville aquifer would not significantly impact shallow water table levels or groundwater-dependent vegetation and wetlands, was not adequately substantiated.

Proposed scheme provisions: Water supply management

The amendment, as advertised, proposed that "Prior to construction, a Water Supply Management and Monitoring Plan shall be prepared in consultation with the EPA on advice from the WRC. The Plan will address:

- i) groundwater monitoring, data analysis and reporting;
- ii) ongoing aquifer modelling to ensure that the growth and ultimate population of the development area is sustainable in terms of available water supply; and
- iii) the identification of appropriate contingency options for water supply" (Bowman Bishaw Gorham, 1997).

Assessment

The area considered for the assessment of the environmental significance of this component and the factors relevant to the component is Swan Coastal Plain.

The potential impacts threatening the adjacent Ramsar wetlands that are of most significance are the possible indirect effects on water levels caused by the use of groundwater, and a potential change in the quality of surface water and groundwater inputs to the wetlands.

The site is located down gradient of both surface and groundwater flow of Lake Mealup and Lake McLarty (Figure A5 Engineering Report 2 of the ODP). This, in combination with the very high phosphorus retention capacity of the Deep Spearwood Soils west of the wetlands should result in no nutrient transport to the lakes (Response to submissions, BBG, 1998a).

Numerical modelling of groundwater abstraction was utilised by the consultants to predict drawdown in both the superficial and Leederville aquifers. Groundwater is proposed to be abstracted from the upper Leederville aquifer at a depth of 140 to 160 m. No abstraction will occur within the superficial aquifer which is the groundwater source supplying the local wetlands. It was predicted that due to the discharge characteristics of the Leederville aquifer in this area, groundwater abstraction from this formation should cause minimal impact on shallow water table levels or groundwater-dependent vegetation and wetlands (Bowman Bishaw Gorham, 1997).

This assumption was clarified by the WRC (WRC, correspondence dated 28 April 1998), as further information suggests that although the groundwater model significantly underestimates drawdown on a regional scale, Lakes Mealup and McLarty are not likely to be significantly affected by pumping from the nominated production interval. The effect on the superficial formations will be greatest where the production interval subcrops, around 7.5 to 8km east of the borefield (WRC, 1998) (Figure 6) but the magnitude of this drawdown cannot be predicted with the available data. It is not expected that this drawdown will be significant, however, due to the high level of the water table within the superficial aquifer in this region.

One EPP lake is located within the area likely to be affected by the drawdown resulting from groundwater abstraction (Figure 6). The impact of this drawdown is expected to be minimal, however, as the superficial aquifer in this region is consistently full. The high water table is controlled by many artificial channels that to drain the area and consequently additional downward leakage resulting from groundwater abstraction is likely to be indistinguishable (WRC, 1998).

Relevant environmental factors and objectives

The following environmental factor was identified from the consideration and assessment of the potential for drawdown in the Leederville aquifer effecting nearby Ramsar-listed Lakes Mealup and McLarty as discussed above.

Relevant factor	EPA objective
Wetlands	to maintain the integrity, functions and environmental values of wetlands

Having particular regard to:

- a) advice from WRC suggesting that there should be minimal indirect impacts to water levels in nearby Ramsar-listed wetlands caused by groundwater drawdown from the supply of groundwater to the development; and
- b) Lake Mealup and McLarty being located upgradient of groundwater and surface water flows from the development and the high phosphorus retention capacity of the soil of the surrounding area;

it is the EPA's opinion that the proposed amendment will meet the EPA's objective for wetlands.

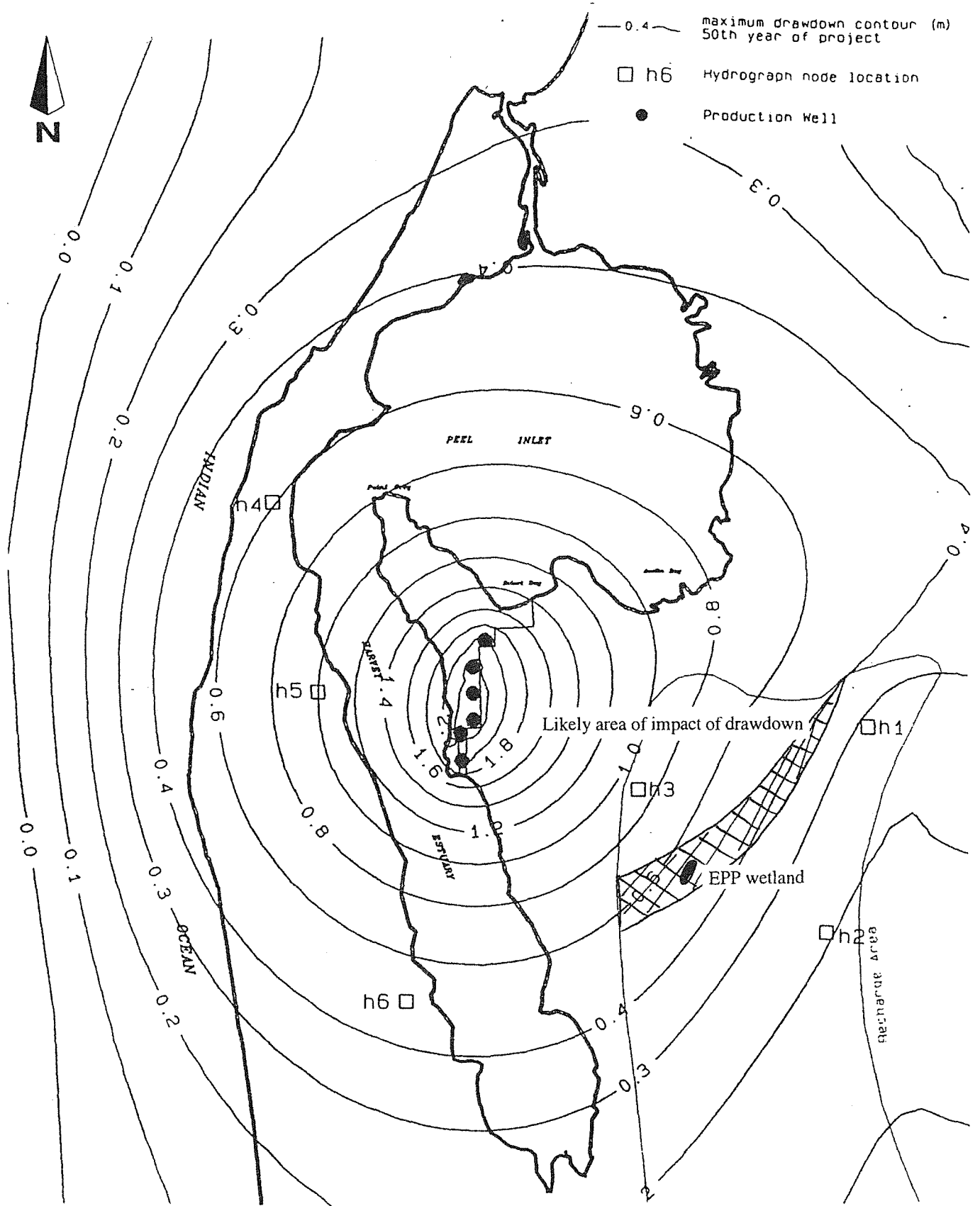


Figure 6: Likely area of impact of groundwater abstraction on the superficial aquifer and predicted potentiometric drawdown in the Leederville aquifer after 50 years of pumping. Source: Bowman Bishaw Gorham.

EPA recommendations on environmental conditions

It is acknowledged that the environmental review has proposed a number of scheme provisions which could, if implemented, manage the environmental impacts resulting from the proposed development. The EPA considers that it is necessary, however, to impose a number of conditions to ensure that appropriate planning mechanisms will be implemented into the scheme amendment prior to gazettal. It is recommended that the following environmental conditions should be imposed:

- (i) Prior to finalisation of subdivision, a Water Supply Management and Monitoring Plan shall be prepared by the developer for the amendment area, to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection, Peel Inlet Management Authority, Water and Rivers Commission, Water Corporation and the Shire of Murray.

This Plan shall address:

- i) groundwater monitoring, data analysis and reporting, including monitoring of water quality and quantity in Lake Mealup and Lake McLarty;
 - ii) ongoing aquifer modelling to ensure that the growth and ultimate population of the development area is sustainable in terms of available water supply; and
 - iii) the identification of contingency options for water supply in the event that abstraction is determined to have a direct impact on Lake Mealup or Lake McLarty.
- (ii) Where groundwater is used to supply drinking water, the water quality of this supply shall meet appropriate drinking water quality standards, including those in the NHMRC/ARMCANZ Australian Drinking Water Guidelines (1996) or latest version of those guidelines.
 - (iii) Monitoring of the public water supply shall be in accordance with NHMRC/ARMCANZ Australian Drinking Water Guidelines (1996) or latest version of those guidelines.

3.7 Foreshore - significance of remnant vegetation and proposed management of impacts of development.

Description

The amendment will allow the development of land with a significant amount of foreshore within the Peel-Harvey Estuary. Remnant vegetation remains on nearly one third of the site. The remainder of the site is cleared or parkland cleared to allow for the grazing of sheep. The amendment area directly abuts reserves 33039, 4990, 27528, 11718, and 2738.

The ODP proposes a continuous system of recreational and conservation areas around the entire Point Grey peninsula with the exception of breaches at the proposed marina and sailing club sites (Figure 3). These conservation areas around the foreshore will be either privately owned or vested as foreshore reserve (WRC), recreation reserve (Shire) or conservation reserve (CALM).

Some areas within the amendment area that are proposed to be retained for conservation purposes shall remain in private ownership. These areas consist of an area on the tip of the promontory, areas developed for rural residential purposes, and a 95ha area in the south west of the development site.

A vegetation survey was undertaken over a two day period in April. The survey encompassed all of the perimeter of the site and also several foot transects in selected remnants of the different vegetation types (Appendix C, Bowman Bishaw Gorham, 1997). The biological surveys did not find any Declared Rare and Priority Flora on the site.

The vegetation falls within the Spearwood and Bassendean vegetation systems as delimited by Beard (1979, 1981). Previous work on the site (Dames and Moore, 1987) identified ten vegetation types, ranging from Tuart and Jarrah/Banksia Woodland to Grass/Sedge Salt Flats.

It is proposed that at least 18ha of remnant vegetation will be cleared for development, around 5% of the existing remnant vegetation. This includes the removal of 8ha of Banksia woodland to allow construction of the modified marina design and associated development, and 10ha of parkland tree vegetation cleared from an area of around 50ha to facilitate the special residential development.

Concerns were raised in submissions that the project would result in increased pressure on the existing reserves within and adjacent to the development area from inflated public access and recreation, fire protection and other operational tasks within the reserves such as fox baiting.

Public submissions observed that the EPA's environmental review Instructions state that "Particular attention should be given to the interface between [conservation] areas adjacent to the development, management of human pressures, dieback and hydrological impacts (if any). Attention should also be given to criteria used which trigger implementation of specified management measures." It was felt that the environmental review provided no information in response to these instructions, hence deferring the above issues to the development phase.

WRC and PIMA consider that the proponent has failed to demonstrate that sound environmental planning principles have been used to identify appropriate foreshore reserves at Point Grey. The current boundaries are considered unsatisfactory as they do not afford appropriate protection to remnant vegetation, habitat, and soils that are prone to erosion. The WRC indicated that the proponent should be required to delineate foreshore boundaries based on the biophysical criteria identified within the emerging Statewide foreshore policy (Government of WA, 1998a, 1998b). Application of biophysical criteria to Point Grey would require the protection of all remnant foreshore vegetation, soil types prone to erosion, flood prone land, and significant topographical features within foreshore reserves.

The WRC and PIMA does not accept private ownership of foreshores in urban areas. The draft Statewide Foreshore Policy (Government of WA, 1998a, 1998b) acknowledges that the current requirement for foreshore areas in urban districts to be protected by reserves is sound. It is clear that the proposal in its current form does not conform to either existing or emerging WRC Foreshore Policy requirements.

Ministry for Planning (MfP) recommend that the ODP be modified to include the foreshore reserves identified in the final IPRSP and proposed for inclusion in the PRP (WAPC, 1997). Inconsistencies with the PRP include the areas proposed for development of the marina, sailing club, and wilderness lodge chalets; the area proposed for special residential development in the extreme south of the amendment area; the site for the proposed constructed wetland; and the width of some of the foreshore reserve boundaries or Public Open Space around the amendment area.

It was expressed in public submissions that the flora and fauna survey for the environmental review, undertaken on only 2 days in April, was not adequate to determine the diversity of species present. It was argued that the large area of land involved in this proposal and the presence of ten different vegetation types suggests that more time would have been required for an adequate plant census. The flora survey should have been conducted in spring to allow accurate identification of plants using floral structures and to observe species which would be dormant over summer and early autumn. Consequently the survey may seriously underestimate the biodiversity of the site.

Proposed scheme provisions: Foreshore and conservation reserve management

The amendment, as advertised, proposed that "Prior to construction a Foreshore and Conservation Reserve Management Plan shall be prepared for the adjoining reserve areas, following consultation with the EPA, PIMA, CALM and the Shire of Murray. The Plan shall address off-site impacts to System 6 and existing conservation areas; the interface between these areas and development, the management of human pressures and hydrological impacts; and measures for the management of existing vegetation areas " (Bowman Bishaw Gorham, 1997).

Assessment

The area considered for the assessment of the environmental significance of this component and the factors relevant to the component is the Swan Coastal Plain.

The area proposed for protection of the foreshore delineated in the ODP (Figure 3) has environmental value, however, it would be significantly enhanced if the proposed foreshore reserve was modified. The determination of the final foreshore reserve boundary should involve consideration of biophysical criteria outlined in the draft Statewide foreshore policy (Government of WA, 1998a, 1998b), in consultation with WRC, PIMA and CALM.

In response to the issue of management of potential impacts on conservation areas from increased human pressures, the Shire, in its response to submissions document (Bowman Bishaw Gorham, 1998a), notes that the proposed development is based on the assumption that conservation reserves can be acceptably managed to protect recognised values from the pressures of human usage and general presence. The response to submissions document indicates that this assumption also forms the basis for the process of "Conservation through Reserves" (for example the System 6 Red Book Report, DCE, 1983), a management philosophy which has been the cornerstone of the State Government's approach to conservation since the 1970's. The response to submissions (Bowman Bishaw Gorham, 1998a) also notes that "The fact that reserves can occur adjacent to development and that public access into reserves can be managed is demonstrated by the current practice of creating National and Regional Parks and gazetted conservation reserves within the Metropolitan area."

As stated in the previous section, it is considered that the flora and vegetation survey was inadequate in terms of scope, duration and timing. The inappropriateness of the timing of the flora survey is well illustrated by the fact that 13 of the 21 Declared Rare Flora and Priority Flora listed from CALM's database as being potentially detected in the area would not have been evident at the time of survey, as six species are aquatics or semiaquatics and seven are annuals or geophytes. As the majority of existing remnant vegetation is proposed to be retained in reserves, public open space, or private conservation areas, it is considered that any threatened plant species not presently identified can be adequately protected. However, it is recommended that a Declared Rare Flora and Priority Flora survey should be performed in areas that will be cleared as a result of development to confirm the results of the botanical survey.

Relevant environmental factors and objectives

The following environmental factors were identified from the consideration and assessment of the significance of remnant foreshore vegetation and proposed management of impacts on the foreshore from development as discussed above.

Relevant factor	EPA objective
Vegetation	maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities

Declared Rare and Priority Flora	protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950
Fauna	maintain the abundance, species diversity and geographical distribution of terrestrial fauna
Estuarine vegetation and fauna habitat	maintain the integrity, functions and environmental values of estuaries

Having particular regard to:

- a) the retention of the majority of remnant vegetation on site (only 5% of the existing remnant vegetation is proposed to be cleared);
- b) the provision contained in the proposed amendment which requires the preparation of a Foreshore and Conservation Area Management Plan prior to development; and
- c) the potential for a reduction in the amount of Banksia woodland that would be cleared as a result of possible limitations imposed on the size of the marina development;

it is the EPA's opinion that the proposed amendment will meet the EPA's objectives for vegetation, declared rare and priority flora, fauna, and estuarine vegetation and fauna habitat as outlined above providing that a Declared Rare Flora and Priority Flora survey will be conducted at an appropriate time of areas that are proposed to be cleared as a result of development.

EPA recommendations on environmental conditions

The EPA recommends that an environmental condition be imposed requiring a Declared Rare Flora and Priority Flora survey to be conducted prior to finalisation of subdivision at an appropriate time of the year in areas within the amendment area that are proposed to be cleared to allow development. The protection of any species identified should be discussed as part of the Foreshore and Conservation Area Management Plan.

It is acknowledged that the environmental review has proposed a number of scheme provisions which could, if implemented, manage the environmental impacts resulting from the proposed development. The EPA considers that it is necessary, however, to impose a number of conditions to ensure that appropriate planning mechanisms will be implemented into the scheme amendment prior to gazettal. It is recommended that the following environmental conditions should be imposed:

- (i) Prior to finalisation of the Outline Development Plan, the boundaries of areas to be set aside for conservation, including the foreshore reserve area, shall be determined to the requirements of the EPA on advice from the DEP, PIMA, CALM, Ministry for Planning and the Shire of Murray. An area of remnant vegetation of no less than that which is depicted in the ODP (Bowman Bishaw Gorham, 1997) shall be retained for conservation.

In defining the boundary of the conservation areas, the following biophysical criteria should be taken into consideration:

- i) vegetation;
- ii) hydrology;
- iii) soil type;
- iv) geology;
- v) topography;
- vi) foreshore function;
- vii) habitat;

- viii) climatic variability;
 - ix) land use pressure;
 - x) archaeological and ethnographic sites.
- (ii) Prior to finalisation of subdivision application, a Foreshore and Conservation Area Management Plan shall be prepared by the developer for proposed and existing conservation areas, both within and adjacent to the amendment area, to the requirements of the EPA on advice from the DEP, PIMA, CALM and the Shire of Murray.

This Plan shall address:

- i) off-site impacts to adjacent System 6 areas C50 and C51 and other conservation areas adjacent to the amendment area;
- ii) the interface between conservation areas, both existing and proposed, and development;
- iii) management of human pressures on existing and proposed conservation areas, including degradation of the environment from off-road vehicles, rubbish dumping, threats to wildlife from domestic pets, weeds, and control of public access to sensitive conservation areas;
- iv) protection of Declared Rare and Priority Flora;
- v) waterbird protection;
- vi) management of hydrological impacts;
- vii) security of tenure, management and vesting arrangements of proposed conservation areas;
- viii) mosquito management; and
- ix) management of existing areas of remnant vegetation.

In the event that conservation areas remain in private ownership, the Foreshore and Conservation Area Management Plan shall denote that clearing of remnant vegetation in these areas be restricted to the minimum possible. Building and development within conservation areas shall be in harmony with the area and maintain visual amenity.

3.8 Avalon cave - public safety and management.

Description

A cave is present within the amendment area. The cave, named Avalon Cave, was discovered in 1959 by Lex Bastion. The cave is considered to be the most spectacular formation cave between Yanchep and Cape Naturaliste (Mr L Bastion, pers comm). It contains stalactites, stalagmites, flow pools and other forms of decoration.

The cave is thought to extend about 90m in length and is about 20m at its widest point (Figure 7). The cave fits into a rectangular area of about 90m by 35m, in a south easterly direction from the entrance mouth.

Proposed scheme provisions

None proposed.

Assessment

The area considered for the assessment of the environmental significance of this component and the factors relevant to the component is the Swan Coastal Plain.

AVALON CAVE LW - 1

Surveyed By:-
 Raulaigh Webb
 Noel Plumley
 Francine O'Meara
 Steve Brooks

Date:- 13 September 1987

Instruments Used:-
 Sunto Compass
 Sunto Clinometer
 Steel Tape

Drawn & Drafted by:- Raulaigh Webb

ASF grade:-55

- | | | |
|------|----------------------|-------------------------------|
| Key: | ⊗ Stalactites | ↕ Vertical Change of Gradient |
| | ⊙ Stalagmites | ⊕ Crystal Pool |
| | ⊘ Sand | ○ Survey Station |
| | ⊙ Blochs | + Bone Material |
| | ⊗ Columns | |
| | ⊘ Limestone | |
| | ⊘ Tree Roots | |
| | ⊘ Direction of Slope | |

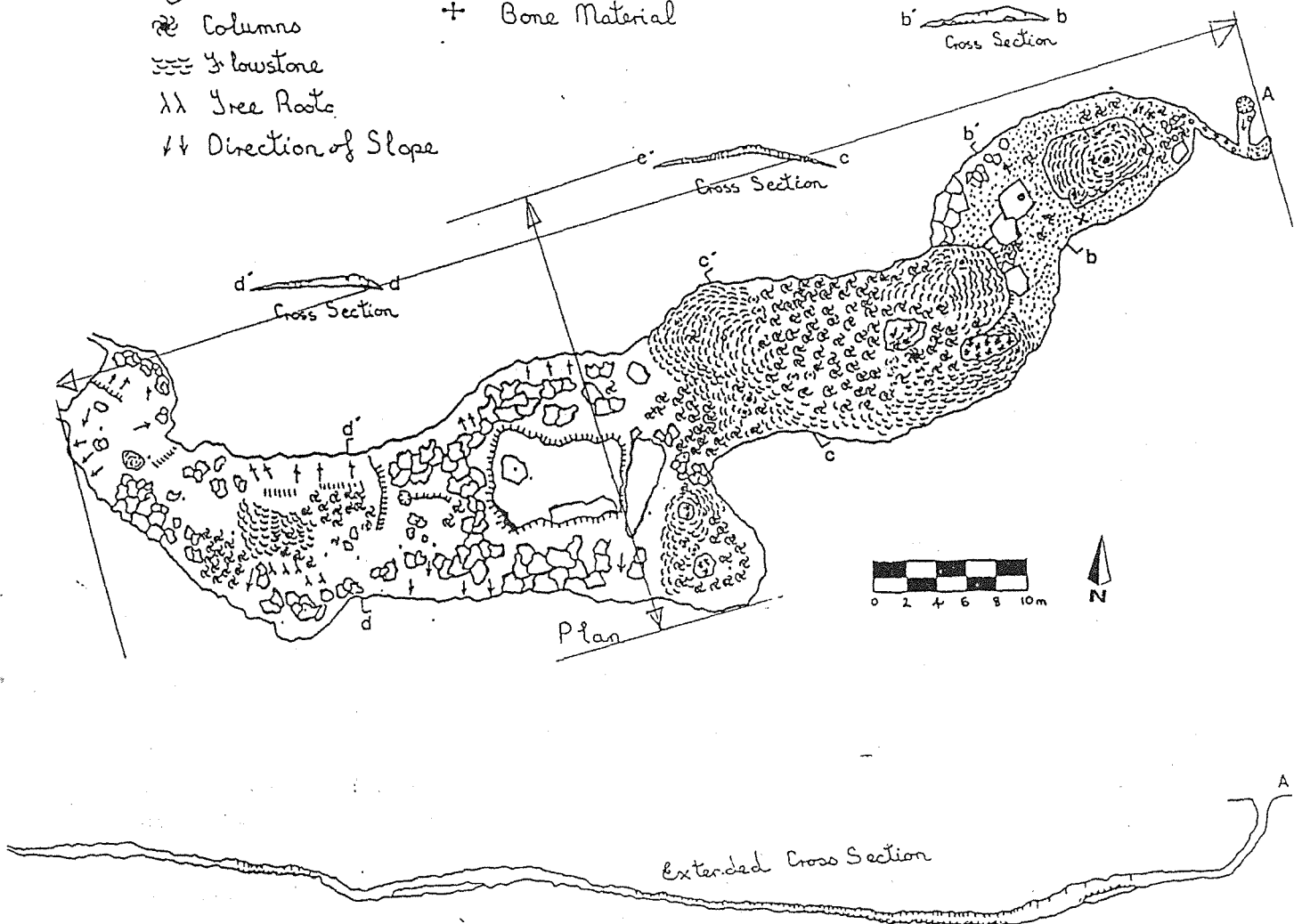


Figure 7: Survey map of Avalon Cave.

The land owner has agreed that the cave should be protected. It has been suggested by the consultants (Bowman Bishaw Gorham, 1998b) that the area above the cave be utilised as public open space and that the cave be secured from uncontrolled access by the installation of a fence and locked gate. Adequate protection and safety measures shall be agreed to prior to development.

Relevant environmental factors

The following environmental factor was identified from the consideration and assessment of the issue of public safety and management of Avalon Cave discussed above.

Relevant factor	EPA objective
Cave - impact of development	maintain the environmental, scientific, cultural and recreational values of cave landforms

Having particular regard to:

- a) the agreement of the land owner to protect the cave; and
- b) lack of protection and safety measures proposed in the environmental review;

it is the EPA’s opinion that the preparation of a Cave Management Plan is required prior to finalisation of the ODP to ensure the EPA’s objective for caves may be met.

EPA recommendations on environmental conditions

A Cave Management Plan should be prepared by the developer prior to finalisation of the ODP, to the requirements of the EPA on advice from the DEP, the Speleological Research Group and the Shire of Murray.

This Plan shall address:

- a) the protection of morphology of the cave including hydrological regime;
- b) the minimum buffer requirements for protection of the above;
- c) proposed development of land above the cave; and
- d) the control of public access.

3.9 Mosquitos - public amenity.

Description

The Peel-Harvey region contains a significant area of samphire marshes which act as a breeding ground for mosquitos. The Point Grey peninsula contains areas of samphire marsh, notably at Robert Bay and between Stony Point and Mealup Point, and is well within the flight radius of mosquitoes breeding outside the amendment area. The development proposal outlined in the ODP includes the option to build a constructed wetland in the degraded wetland area near Robert Bay.

Since the opening of the Dawesville Channel, mosquitoes have begun to breed all year round in the Peel-Harvey Estuary and surrounding areas. Consequently, the frequency of spraying has increased from 4 to 17 times per year, which has necessitated a five-fold increase in the use of insecticide.

The Peel Region is known as the worst area in the State for the occurrence of Ross River virus, which is now endemic in the district. It appears that Macropods are the carriers for Ross River virus, transferring the disease to mosquitos. Kangaroos are prevalent on the Point Grey Peninsula and are likely to remain within the boundary of the golf course.

The saltmarsh mosquito control program carried out by the Health Department of WA (HDWA) in collaboration with the Shire of Murray and other Peel Region local governments is fully stretched and cannot be expanded to include the Point Grey area without the availability of additional financial resources. In addition, Point Grey is currently not monitored for mosquito and Ross River virus activity and the HDWA funded surveillance team at the University of WA is fully committed and could not expand their activities to include Point Grey without the allocation of additional resources.

Concerns were raised in public submissions that the exposure of future residents to mosquito-bourne disease had not been adequately addressed. It was felt that no consideration was made of insect movement from areas outside the development within a 5km radius, as potential mosquito breeding sites were identified within the development area only. It was also noted that the constructed wetland near Robert Bay may create a new mosquito breeding ground.

WRC noted that mosquito control measures may lead to the contamination of local water resources and wetlands. Management measures such as the filling of wetlands or damplands, or drainage of such areas, are not supported by WRC.

Proposed scheme provisions: Robert Bay wetlands management

The amendment, as advertised, proposed that "Prior to construction of the Robert Bay Wetland, a Wetland Management Plan shall be prepared in consultation with the EPA on advice from PIMA, the Shire of Murray and the Water Corporation. The Plan will address:

- a) maintenance of existing drainage functions of the Robert Bay drain;
- b) minimisation of mosquito breeding areas;
- c) maximisation of ecological and habitat functions of the wetland; and
- d) ongoing monitoring of wetland water quality and ecological functions (Bowman Bishaw Gorham, 1997).

Assessment

The area considered for assessment of the environmental significance of this component and the factors relevant to the component is the amendment area.

The issue of mosquitos is a regional problem. The land owner has agreed to manage mosquitoes within the amendment area. Although the land owner cannot be responsible for mosquitos that breed elsewhere and travel to the peninsula, this development will result in an increase in the population that is exposed to mosquitos. It is probable that the land owner would fund mosquito control, in the form of spraying or runnelling, (estimated at between \$ 10 000 and \$ 25 000 per year) within the amendment area (M Bowman, pers comm).

The proposed Robert Bay wetland will potentially create a new mosquito breeding ground. The environmental review states that this potential mosquito habitat can be managed through habitat modification and other measures, however, the Health Department maintains that there are no proven mosquito control measures which are effective in constructed wetlands.

The Peel-Harvey Estuary is internationally recognised as a waterbird habitat. Chemical management of mosquitos may have a detrimental effect on bird breeding, associated wetland habitat and feeding areas in and adjacent to the amendment area. Until the effect of insecticide

spraying on these environmental considerations is determined, it is not recommended that mosquitoes in the amendment area be controlled with chemicals. Runnelling would appear to be effective if correctly installed and maintained, with minimal impact on habitat areas (Mr T Wright, HDWA, pers comm).

The environmental consequences of runnelling as a mosquito control measure have not yet been assessed by the EPA. A study into the ecological effects of runnelling found that acidification did not occur but there was a minor decrease in pH, lower concentrations of ammonium, an increased abundance of phytoplankton, primary and secondary consumers, and no significant differences in saltmarsh plant biomass or bird abundance (Latchford, 1996).

The 1987 Mallina Holdings application to rezone the Point Grey peninsula was refused by the EPA, in part due to reduced public amenity resulting from increases in mosquito numbers.

The EPA considered the impact of mosquitoes on the proposed residential subdivision at Amarillo, Karnup (EPA, 1997). In that assessment (Bulletin 862) the EPA noted that there is a need for the State Government to consider and implement off-site measures to adequately control mosquito numbers at Amarillo so that the EPA's objectives could be met.

The EPA reiterates this advice in relation to the proposed development of Point Grey. The risk to human health posed by mosquitoes is a regional issue beyond the scope of individual proposals by private landowners and requires a strategic approach by the State Government. It is recommended, however, that prospective buyers are notified that the land is within an endemic mosquito area through the use of a covenant.

Relevant environmental factor

The following environmental factor was identified from the consideration and assessment of the issue of mosquitoes as discussed above.

Relevant factor	EPA objectives
Mosquitoes	<ul style="list-style-type: none"> • to ensure that mosquito numbers on the site should not adversely affect the health, welfare and amenity of future residents; and • to ensure the breeding of mosquitoes is controlled to the satisfaction of the Health Department of Western Australia without adversely affecting other flora and fauna

Having particular regard to:

- a) the fact that risk to human health from mosquitos is a regional issue; and
- b) the recommendation in the environmental review that no additional mosquito breeding areas be created;

it is the EPA's opinion that the development outlined in the ODP for the amendment area can meet the EPA's objectives to control the breeding of mosquitoes without adversely affecting other flora and fauna. The issue of mosquitoes already on site is addressed under Other Advice below.

EPA recommendations on environmental conditions

The EPA recommends that an environmental condition be imposed requiring measures to be put in place to ensure that prospective purchasers of land within the amendment area are advised of the existence of a health risk due to mosquitoes.

It is acknowledged that the environmental review has proposed a number of scheme provisions which could, if implemented, manage the environmental impacts resulting from the proposed development. The EPA considers that it is necessary, however, to impose a number of conditions to ensure that appropriate planning mechanisms will be implemented into the scheme amendment prior to gazettal. It is recommended that the following environmental conditions should be imposed:

- (i) Prior to commencement of construction of the Robert Bay Wetland a Wetland Management Plan shall be prepared for the adjoining reserve areas, to the requirements of the EPA on advice from the DEP, PIMA, WRC, WC, the Health Department and the Shire of Murray. The Shire of Murray shall be responsible for the implementation of the Wetland Management Plan.

This Plan shall address:

- a) maintenance of existing drainage functions of the Robert Bay drain;
- b) minimisation and management of mosquito breeding areas within the amendment area;
- c) maximisation of ecological and habitat functions of the wetland; and
- d) ongoing monitoring of wetland water quality and ecological functions

3.10 Environmental performance - audit of implementation

Description

Section 48H of the *Environmental Protection Act 1986* requires that the Shire of Murray monitor, or cause to be monitored, the implementation of any environmental conditions that may be imposed on Amendment 104 for the purpose of determining whether or not the condition has been or is being complied with.

If the Minister for the Environment is not satisfied with any monitoring conducted the Minister may recommend the steps necessary to achieve compliance with the condition.

Assessment

The EPA considered a number of methods for implementing the performance review requirements required under Section 48H.

To achieve this, the EPA believes that it is appropriate for the performance review or auditing of the environmental conditions to occur as part of the review of the current Shire of Murray Town Planning Scheme. However, prior to the finalisation of the ODP, the developer should provide adequate baseline data related to the environmental components of the amendment and the relevant environmental factors identified in Section 3 of this report, so that the implementation of the amendment can be monitored.

This baseline audit statement is required to provide a benchmark for future audits. The EPA notes that much of the information required for the baseline audit statement may be contained in the environmental review document.

The Shire of Murray is currently undergoing a review of its Town Planning Scheme. Consequently, it may be more appropriate to review the environmental conditions in five years from the issuing of the Statement of Conditions by the Minister for the Environment, or the next review of the Town Planning Scheme, whichever is the earlier.

The review of the environmental conditions should be made available to the DEP. The EPA may recommend changes to conditions or actions required within the amendment area to the Minister for the Environment, following consideration of the performance review.

EPA recommendations on environmental conditions

The EPA recommends that an environmental condition be imposed requiring:

- a performance review of the development proposed for Lots 75, 137-139, 293, 299, 322, 672, 727, 729, 738, 1132, 1133 & 1145 (Point Grey) to determine whether the development is meeting the environmental objectives as stated in this report; and
- the Shire of Murray to review the performance of the environmental conditions imposed on the Shire of Murray TPS 4 Amendment 104 in five years from the issuing of the Statement of Conditions by the Minister for the Environment, or the review of TPS No. 5 under Section 7AA of the *Town Planning and Development Act*, whichever is the earlier.

4. Conditions

Section 48D of the Environmental Protection Act 1986 requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the scheme amendment and on the conditions to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

To ensure that the scheme provisions documented in the environmental review are incorporated into the TPS text, the EPA considers that it is necessary to impose a number of conditions to reflect the scheme provisions.

Accordingly, the EPA has developed a set of conditions which they recommend should be imposed if Amendment 104 to the Shire of Murray's Town Planning Scheme No. 4 is approved. These conditions are presented in Appendix 3 and are based on the EPA recommendations in Section 3.

Matters addressed in the recommended conditions include the following:

- a) implementation;
- b) marina;
- c) nutrient and irrigation management;
- d) water supply management;
- e) foreshore and conservation area management;
- f) waterbird management and monitoring;
- g) construction management;
- h) cave protection;
- i) mosquitoes;
- j) Robert Bay wetlands management;
- k) subdivision and development; and
- l) audit of implementation of environmental conditions.

5. Other advice

Regional planning considerations

The proposed development outlined in the environmental review and the ODP is inconsistent with current Government agreed recommendations for regional planning in the Peel Region.

The IPRSP was finalised and released by the WAPC in 1997 (Figure 4). This document will be used as a guide for future development within the region as it provides the basis for the preparation of the Peel Region Scheme. The Peel Region Scheme will provide the statutory planning mechanisms to allow implementation of the proposals in the structure plan.

Inconsistencies of the proposed amendment with the IPRSP include:

- a large portion of the 'Residential - Traditional neighbourhood village' which is described in the IPRSP as 'Greenbelt Rural Living'. The IPRSP classification suggests that larger lot subdivision such as 'Special Residential' and 'Rural Residential/ Landscape Protection' would be more suited to this area. The IPRSP does not propose residential development within the amendment area;
- the density requirements of the 'Waterfront Tourist Village/ Harbour-side Village and Golf Course Estate', which fall under the responsible authority's classification of 'Tourist', may be inconsistent with the urban density requirements under the IPRSP's 'Tourist' zone;
- the amount of foreshore area to be reserved is not consistent with that proposed to be included in the Peel Regional Park, especially in the areas proposed for the Mealup Point village and the tourist developments associated with the marina;
- the area proposed for development of Wilderness Lodge and Chalets is also proposed to be included in the Peel Regional Park, as is the area in the extreme south of the amendment area which is proposed for special residential development.

The EPA notes the inconsistencies of the ODP submitted for assessment of this amendment with recommendations for regional planning. Generally, the EPA finds that the scale of development as proposed in the final IPRSP, including the areas identified for conservation, would provide better protection for the environment than what is proposed by the Shire of Murray in this amendment.

Mosquitoes

The Peel Region is one of the worst areas in the State for the occurrence of mosquito-borne diseases. This amendment will allow urban development to proceed in an area where the population will be subject to reduced public amenity due to mosquitoes.

The methods used for control of mosquitoes on-site can be limited to those that do not cause adverse ecological effects. However, mosquitoes will travel into the amendment area from external breeding grounds. The ability to control mosquito travel into the amendment area is low. Off-site mosquito control would be more effective but is likely to have significant environmental impacts on the surrounding Ramsar wetland and fauna.

The issue of mosquitoes is a regional problem that requires a planning strategy or other strategic approach by Government to provide management measures that have environmental consequences that do not compromise with Ramsar, JAMBA and CAMBA treaty obligations.

6. Conclusion

The EPA has concluded that Amendment 104 to the Shire of Murray Town Planning Scheme No. 4 to rezone Lots 75, 137-139, 293, 299, 322, 672, 727, 729, 738, 1132, 1133 & 1145 from Rural to Special Development can be modified to be capable of meeting the EPA's objectives through the provision of additional conditions identified by the EPA. However, there is insufficient information in relation to the environmental acceptability of the marina and

therefore the development application for the marina should be referred to the EPA for assessment under Section 38 of the EP Act. In addition, the EPA finds that the scale of development as proposed in the final IPRSP, including the areas identified for conservation, would provide better protection for the environment than what is proposed by the Shire of Murray in this amendment.

The amendment will allow a variety of land uses to be permitted within the amendment area, such as residential development, tourism, waste water treatment and disposal, a marina and golf course. It is recommended that, given the uncertainty associated with some significant environmental issues, notably nutrient management, foreshore conservation and Avalon Cave, the final ODP for the amendment area be submitted to the EPA prior to final approval from the WAPC.

The performance review or auditing of the environmental conditions shall occur as part of the review of TPS No. 4 by the Shire of Murray. Adequate baseline data shall be provided by the developer prior to the subdivision or development so that the implementation of the amendment can be monitored.

7. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the following relevant environmental factors identified from the discussion of components of the amendment of environmental significance in this report:
 - Vegetation;
 - Declared Rare and Priority Flora;
 - Fauna;
 - Wetlands;
 - Estuarine vegetation and fauna habitat;
 - Cave;
 - Estuarine water quality; and
 - Mosquitoes.
2. That the issue of the marina has not been assessed in this assessment of Shire of Murray Town Planning Scheme No. 4 Amendment 104 and the development application for the marina shall be referred to the EPA at a later date.
3. That, subject to the satisfactory implementation of the provisions contained in Amendment 104 to the Shire of Murray Town Planning Scheme No. 4 and the EPA's recommended conditions as set out in Appendix 3, the proposal is capable of being managed to meet the EPA's objectives.
4. That the scale of development as proposed in the final Inner Peel Region Structure Plan would provide better protection for the environment than the proposed amendment by the Shire of Murray.
5. That if the amendment is adopted, the Minister imposes the conditions set out in Appendix 3 of this report.

Appendix 1

List of submitters

Government Agencies

Aboriginal Affairs Department

Agriculture Western Australia (AgWA)

Bush Fires Board of WA

Department of Conservation and Land Management (CALM)

Department of Transport (DOT)

Health Department of Western Australia (HDWA)

Peel Inlet Management Authority & Water and Rivers Commission (PIMA)

Water Corporation (WC)

Organisations

Conservation Council of WA

The Environment Centre of WA

Goodale Sanctuary Pty Ltd

Lake Mealup Preservation Society

Mandurah Environmental Advisory Committee

Peel Preservation Group

River Districts Association

Soroptimist International of Joondalup

Waterbird Conservation Group Inc

Western Australian Naturalists' Club (Inc)

Wildflower Society of WA

Members of the Public

Mr George Armstrong

Phyllis Bentley

Norah Brockman

Ms M E Campbell

Mr R Campbell

A H Gray

Gray & Lewis

A. H. Grovy

R. K. Hammond

Patricia Higgins

Diana Hitchin

J B Horner

L Howard

Mr David James

Ms J Laing

R, M, F & S Lake

J & W Manchester

D H Matthews

Dr A Motherwell

O Mueller

Patricia Nolan

Kathleen Peggs

J Taylor

S & M Telford

M Vaughan

Mrs Vivian Wells

Mr P Wilmont

V Woodland

Appendix 2

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Appendix 3

List of recommended Ministerial Conditions

**STATEMENT THAT A SCHEME MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF DIVISION 3 OF PART IV OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

**SHIRE OF MURRAY TOWN PLANNING SCHEME NO. 4
AMENDMENT NO. 109**

Scheme purpose: (a) to rezone from 'Rural' to 'Special Development'
Lots 75, 137-139, 293, 299, 322, 672, 727, 729,
738, 1132, 1133 & 1145, Point Grey; and
(b) to amend the Shire of Murray Town Planning
Scheme No. 4 Scheme Maps accordingly.

Responsible Authority: Shire of Murray

Responsible Authority Address: Pinjarra Road
Pinjarra WA 6208

Assessment Number: 1084

Report of the Environmental Protection Authority: Bulletin 899

Subject to the following conditions, there is no environmental reason why the town planning scheme amendment to which the above report of the Environmental Protection Authority relates should not be implemented:

1 Implementation

- 1-1 Prior to finalisation of the Outline Development Plan for development within the amendment area, the Outline Development Plan shall be submitted to the Environmental Protection Authority.
- 1-2 Subdivision and development shall be in accordance with an Outline Development Plan, finalised to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, Peel Inlet Management Authority, Water and Rivers Commission, Department of Conservation and Land Management, the Shire of Murray and the Western Australian Planning Commission.

2 Waterbird Management and Monitoring Plan

- 2-1 A Waterbird Management and Monitoring Plan shall be prepared and implemented to provide ongoing protection for waterbirds and their associated habitat.
- 2-2 Prior to finalisation of any subdivision application and at least two summers before finalisation of the development application for the marina, a Waterbird Management and Monitoring Plan shall be prepared by the developer for areas of waterbird habitat and areas adjacent to waterbird habitat, to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection, Peel Inlet Management Authority, Department of Conservation and Land Management and the Shire of Murray.

This Plan shall address:

1. bird utilisation of the proposal area, including patterns of roosting, nesting, feeding, and mating, in particular for the area proposed for development of the marina. Utilisation information should be based on observations over at least two summer visiting periods;
2. modification of the proposal, if necessary, to ensure waterbird usage of the area is not compromised;
3. potential impacts of the development on bird life during the construction and post-construction stages;
4. management of these impacts on waterbirds during construction, including use of sight screens where appropriate to minimise visual impact;
5. management of ongoing impacts on waterbirds from pedestrians, domestic pets, off-road vehicles and boats, including but not limited to the following measures:
 - i) limitation of intrusive human access to sensitive portions of the foreshore;
 - ii) control of vehicles by physical barriers;
 - iii) public education to develop increased awareness of the sensitivity of the conservation areas;
 - iv) adequate sign posting to define exercise areas for horses and dogs;
 - v) control of feral animals where practicable; and,
 - vi) modification and improvement of conservation practices.

3 Construction Management Plan

- 3-1 A Construction Management Plan shall be prepared and implemented to ensure the protection of remnant vegetation, fauna and their associated habitat during construction.
- 3-2 Prior to any construction or site disturbance within the amendment area for the purposes of development permitted by this amendment, a Construction Management Plan shall be prepared by the developer for the amendment area, to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection and the Shire of Murray.

This Plan shall address:

1. the minimisation of clearing and vegetation disturbance;
2. the protection of foreshore buffers;
3. use of sight screens where appropriate to minimise visual impact during construction adjacent to important waterbird habitat;
4. the control and monitoring of dust, noise and smoke;
5. the prevention and control of the spread of dieback; and
6. the inclusion of environmental protection specifications in all construction-related contracts.

4 Nutrient and Irrigation Management

- 4-1 A Nutrient and Irrigation Management Plan shall be prepared to ensure that there is no nett increase in nitrogen export to the Peel-Harvey Estuary as a result of development within the amendment area. The export of phosphorus and nitrogen from the amendment area to the Peel-Harvey Estuary shall comply with the Environmental Protection (Peel-Harvey Estuarine System) Policy 1992.
- 4-2 Base-line data identifying current export levels of nitrogen as a result of activities on site shall be provided to the Department of Environmental Protection prior to finalisation of the Outline Development Plan.
- 4-3 Prior to the finalisation of the Outline Development Plan referred to in Condition 1-1, a Nutrient and Irrigation Management Plan shall be prepared by the developer to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection, Peel Inlet Management Authority, Water and Rivers Commission and the Shire of Murray.

The Plan shall address:

1. ongoing responsibility for the management and monitoring described in the Nutrient and Irrigation Management Plan;
 2. irrigation and nutrient management of the Golf Course and other landscaped areas;
 3. management practices and nutrient-related objectives for the on-site treatment and disposal of sewage; and
 4. ongoing monitoring and reporting of phosphorus and nitrogen concentrations and movements in the groundwater beneath the site.
- 4-4 The amendment area, with the exception of a small number of lots within the rural-residential development that have an area greater than 4 000m², shall be serviced by a reticulated sewer network, operating by gravity, vacuum sewers and/or pump stations. The design, construction and operation of the sewerage system shall comply fully with relevant Office of Water Regulation and Health Department requirements.
- The reticulated sewerage network shall ultimately be serviced by a tertiary treatment plant, located at least 500m from sensitive land use areas, that will incorporate Biological Nutrient Removal to achieve maximum final treated effluent concentrations of 1 part per million total phosphorus and 5 parts per million total nitrogen.
- 4-5 Interim arrangements for the disposal of effluent involving secondary treatment will be subject to agreement from the Department of Environmental Protection, Office of Water Regulation and the Health Department, to the extent of the duration of operation of the treatment plant and the disposal of effluent.
- 4-6 Conventional on-site effluent disposal systems that are installed on lots over 4 000m² shall not be located closer than 100m to any water source and shall have a minimum 2m vertical clearance to the highest known water table or bedrock. Effluent disposal systems that are of a type that minimise nutrient export shall not be located closer than 30m to a water source.
- 4-7 Prior to finalisation of the Outline Development Plan and in each report required by condition 10-2, it should be demonstrated that there is no nett increase in nitrogen and phosphorus export as a result of development within the amendment area.

5 Water Supply Management Plan

- 5-1 A Water Supply Management and Monitoring Plan shall be prepared and implemented to ensure that there are no effects on water levels in Lake McLarty and Lake Mealup as a

result of the use of groundwater within the amendment area and that the supply of groundwater is sustainable.

- 5-2 Prior to finalisation of subdivision, a Water Supply Management and Monitoring Plan shall be prepared by the developer for the amendment area, to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection, Peel Inlet Management Authority, Water and Rivers Commission, Water Corporation and the Shire of Murray.

This Plan shall address:

1. the ongoing management and responsibility for the maintenance of the management and monitoring contained within the Plan;
2. groundwater monitoring, data analysis and reporting, including monitoring of water quality and quantity in Lake Mealup and Lake McLarty;
3. ongoing aquifer modelling to ensure that the growth and ultimate population of the development area is sustainable in terms of available water supply; and
4. the identification of contingency options for water supply in the event that abstraction is determined to have a direct impact on Lake Mealup or Lake McLarty.

- 5-3 Where groundwater is used to supply drinking water, the water quality of this supply shall meet appropriate drinking water quality standards, including those in the NHMRC/ARMCANZ Australian Drinking Water Guidelines (1996) or latest version of those guidelines.

- 5-4 Monitoring of the public water supply shall be in accordance with NHMRC/ARMCANZ Australian Drinking Water Guidelines (1996) or latest version of those guidelines.

6 Foreshore and Conservation Area Management

- 6-1 A Foreshore and Conservation Area Management Plan shall be prepared and implemented to provide on-going protection for foreshore vegetation, remnant vegetation, the estuary and important fauna habitat.

- 6-2 Prior to finalisation of the Outline Development Plan referred to in Condition 1-1, the boundaries of areas to be set aside for conservation, including the foreshore reserve area, shall be determined to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection, Ministry for Planning, Peel Inlet Management Authority, Department of Conservation and Land Management and the Shire of Murray. An area of remnant vegetation of no less than that which is depicted in the Outline Development Plan contained in the environmental review for Shire of Murray TPS 4 Amendment 104 shall be retained for conservation.

In defining the boundary of the conservation areas, the following biophysical criteria should be taken into consideration:

1. vegetation;
2. hydrology;
3. soil type;
4. geology;
5. topography;
6. foreshore function;
7. habitat;
8. climatic variability;
9. land use pressure; and
10. archaeological and ethnographic sites.

- 6-3 Prior to finalisation of subdivision and at an appropriate time of the year, a Declared Rare Flora and Priority Flora survey shall be conducted in areas within the amendment area that

are proposed to be cleared to allow development. The protection of any species identified should be discussed as part of the Foreshore and Conservation Area Management Plan.

- 6-4 Prior to finalisation of subdivision, a Foreshore and Conservation Area Management Plan shall be prepared by the developer for conservation areas identified in the environmental review for Shire of Murray TPS 4 Amendment 104 and shown on the Outline Development Plan, both within and adjacent to the amendment area, to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection, Peel Inlet Management Authority, Department of Conservation and Land Management and the Shire of Murray.

This Plan shall address:

1. off-site impacts to adjacent System 6 areas C50 and C51 and other conservation areas adjacent to the amendment area;
2. the interface between conservation areas, both existing and proposed in the Outline Development Plan, and development;
3. management of human pressures on existing conservation areas and those proposed in the Outline Development Plan, including degradation of the environment from off-road vehicles, rubbish dumping, threats to wildlife from domestic pets, weeds, and control of public access to sensitive conservation areas;
4. protection of Declared Rare and Priority Flora;
5. waterbird protection;
6. management of hydrological impacts;
7. security of tenure, management and vesting arrangements of proposed conservation areas;
8. mosquito management; and
9. management of existing areas of remnant vegetation.

- 6-4 In the event that conservation areas remain in private ownership, clearing of remnant vegetation in these areas shall be minimised. Building and development within conservation areas shall be in harmony with the area and maintain visual amenity.

7 Cave protection

- 7-1 A Cave Management Plan shall be prepared and implemented to ensure the protection and management of Avalon Cave.
- 7-2 Prior to finalisation of the Outline Development Plan referred to in Condition 1-1, a Cave Management Plan should be prepared by the developer to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection, the Speleological Research Group and the Shire of Murray.

This Plan shall address:

1. the protection of the morphology of the cave including hydrological regime;
2. the minimum buffer requirements for protection of the above;
3. proposed development of land above the cave; and
4. the control of public access.

8 Mosquitoes

- 8-1 Measures shall be put in place to ensure that prospective purchasers are advised of the existence of a health risk due to mosquitoes.

9 Robert Bay Wetlands Management Plan

- 9-1 A Robert Bay Wetland Management Plan shall be prepared and implemented to ensure that there is no increase in potential mosquito breeding habitat and to ensure that the current wetland values are maintained.
- 9-2 Prior to any disturbance of the Robert Bay Wetland a Wetland Management Plan shall be prepared by the developer for the wetlands and adjoining reserve areas, to the requirements of the Environmental Protection Authority on advice from the Department of Environmental Protection, Peel Inlet Management Authority, Water and Rivers Commission, Department of Conservation and Land Management, Water Corporation, the Health Department of Western Australia and the Shire of Murray.

This Plan shall address:

1. maintenance of existing drainage functions of the Robert Bay drain;
2. minimisation and management of mosquito breeding areas;
3. maximisation of ecological and habitat functions of the wetland;
4. design construction and engineering detail;
5. ongoing monitoring of wetland water quality and ecological functions;
6. criteria for performance assessment; and
7. contingency plans in case of failure of the system.

10 Audit of environmental conditions

- 10-1 A report describing the environment in the amendment area and adjoining foreshore reserve in relation to the key environmental factors identified in the Environmental Protection Authority's report (Bulletin 899) shall be provided by the developer prior to any development or work associated with the 'Special Development' zoning, the subject of this amendment, commencing on site.

Note: This report will form the basis of any review of the environmental performance of the proposed development within the amendment area.

- 10-2 The responsible authority shall review the performance of the environmental conditions to which this amendment is subject, every five years after the amendment is approved and published in the Government Gazette, or as the Minister for the Environment directs. The report of this review shall be to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.
- 10-3 The responsible authority shall provide the Department of Environmental Protection with a report of the review required by condition 10-2.

Note: The Environmental Protection Authority may recommend changes and actions to the Minister for the Environment following consideration of the Performance Review.

Appendix 4

Scheme provisions for Shire of Murray TPS 4 Amendment 109

Table 6.1 (continued)

Environmental Management Recommendation Number	Environmental Management Recommendation	TPS Amendment Provision Number
6.25	<p><i>Water and Sediment Quality Monitoring Plan Implementation</i></p> <p>Annually for five years following construction of the marina and thereafter at intervals determined by experience, the Water and Sediment Quality Monitoring Plan will be implemented for the marina in consultation with the EPA upon advice from PIMA.</p>	8

Table 6.2

TPS Amendment 104 Special Provisions

(A)

Specified Land

Lots 75, 137, 138, 139, 293, 299, 322, 672, 727, 729, 738, 740, 1132, 1133 and 1145 Point Grey

(B)

Special Provisions Relating to (A)

1) SUBDIVISION AND DEVELOPMENT

(a) Subdivision and development shall generally be in accordance with an approved Outline Development Plan or any variations as approved by the Council and the Western Australian Planning Commission.

(b) All lots shall be provided with a reticulated water supply system with the exception of those lots larger than 4,000m² in area.

(c) All lots shall be connected to a reticulated sewage system serviced by a centralised sewage treatment plant with the exception of those lots larger than 4,000m² in area.

(d) On lots larger than 2,000m² building envelopes are to be identified and sited at the subdivision stage.

(e) On lots larger than 2,000m² no indigenous trees or other indigenous vegetation shall be destroyed or cleared except where the developer of the estate or landowner obtain the prior consent in writing of Council and where such

vegetation is dead or diseased, or where the clearing is required for the purpose of a firebreak, dwelling, outbuilding, fence, on-site effluent disposal system or driveway within the defined system or driveway within the defined Building Envelope and for access to the Building Envelope from the road.

2) PERMITTED USES ("P")

(a) Notwithstanding the provisions of Clause 5.2.1 the following uses are classified "P" Uses within the Outline Development Plan:

- Golf course/Clubhouse
- Club Premises.

3) PERMITTED USES ("AA")

(a) Notwithstanding the provisions of Clause 5.2.1 the following Uses are classified as "AA" Uses within the Outline Development Plan:

- Chalet Park
- Bed & Breakfast Accommodation
- Hotel
- Hospital
- Education Establishment
- Marina

4) FORESHORE AND CONSERVATION RESERVE MANAGEMENT

(a) Prior to construction a Foreshore and Conservation Reserve Management Plan shall be prepared for the adjoining reserve areas, following consultation with the EPA, PIMA, CALM and the Shire of Murray. The Plan shall address off-site impacts to System 6 and existing conservation areas; the interface between these areas and development, the management of human pressures and hydrological impacts; and measures for the management of existing vegetation areas.

5) NUTRIENT AND IRRIGATION MANAGEMENT

(a) Prior to construction, a Nutrient and Irrigation Management Plan shall be prepared in consultation with the EPA, in order to limit phosphorus export from the site to the Estuary so as to comply with the phosphorus loading targets in the Environmental Protection (Peel-Harvey Estuarine System) Policy 1992. The preparation of the Plan may be undertaken as three independent studies dependent upon and relevant to the level of development proposed and will address:

(i) irrigation and nutrient management of the Golf Course and other landscaped areas;

- (ii) management practices and nutrient-related objectives for the on-site treatment and disposal of sewage; and
- (iii) ongoing monitoring and reporting of phosphorus concentrations and movements in the groundwater beneath the site.

6) BUSH FIRE MANAGEMENT

- (a) The development of land within the Rural-Residential allotment areas shall be subject to a Bushfire Management Plan approved by Council and the Bushfires Board of Western Australia.

7) RURAL-RESIDENTIAL

The following provisions shall apply to the Rural-Residential areas where allotment areas are greater than 4,000m².

- (a) In order to conserve the landscape, trees and other indigenous vegetation shall not be felled or cleared without the prior written approval of the Council except where required for the erection of a dwelling, outbuildings, effluent disposal system, access ways, fences and firebreaks.

- (b) Each dwelling shall be provided with a supply of potable water from either an underground bore or a rainwater storage tank with a capacity of not less than 92,000 litres being connected to a roof catchment with an area of not less

than 120m² in projected plan area. Access shall be permitted to domestic water supplies for emergency fire fighting purposes and all domestic water supply tanks to be fitted with a gate valve to enable fire brigade appliances to draw water. Tank fittings shall be positioned so as to leave 25% capacity of water in the tank.

All water tanks shall be located within the building envelope and where visible from outside of the lot upon which they are situated shall be painted and screened by vegetation to harmonise with the rural character of the locality to the satisfaction of the Council.

- (c) Effluent disposal systems of a type that do not minimise the export of nutrients shall not be located closer than 100m to any water source and shall have a minimum 2m vertical clearance to the highest known water table or bedrock. Effluent disposal systems that are of a type that minimise nutrient export shall not be located closer than 30m to a water source.

- (d) Any fence, other than a fence which may be required by Council to be erected around a swimming pool, shall comprise non-electrified stock-proof or ringlock fencing to a maximum height of 1.2m above the natural surface of the land, with posts being of split jarrah or treated pine.

(e) Notwithstanding the provisions of Clause 9.2.2 the keeping and rearing of stock shall not be permitted within the subdivision on any lot less than 4ha in area, except for domestic purposes and in such case shall not exceed one horse or one cow or two sheep. Stock may be permitted on allotments of larger than 4ha providing that this does not require nor result in removal of vegetation and that stock numbers are maintained at levels in accordance with the standards of good husbandry to the satisfaction of the Department of Agriculture.

(f) Water Supply Provisions:

(i) The subdivider shall make arrangements satisfactory to the Council for prospective purchasers to be advised that a reticulated water supply cannot be provided by the Water Corporation of Western Australia.

(ii) The land is subject to the provisions of the Water Corporation of Western Australia's By-laws applicable to underground water supply and pollution control. The subdivider shall inform all prospective purchasers in writing of the Water Corporation of Western Australia's requirements mentioned in (c) and (d) above.

(iii) A well licence must be obtained prior to construction of a well or bore to draw groundwater. Groundwater may be drawn from each of the lots to supplement household water supply and to supply water for irrigated development

of an area to be determined by the Water Corporation of Western Australia.

(iv) Activities carried out on this land shall not contravene the Water Corporation of Western Australia's By-laws applicable to underground water pollution control.

(g) Where required strategic firebreaks shall be constructed by the subdivider to the specifications of the Bush Fire Board and Council.

8) MARINA MANAGEMENT

Prior to construction of the Marina, a Marina Management Plan shall be prepared in consultation with PIMA, DOT and the Shire of Murray. The Plan shall incorporate:

(i) Design standards to meet EPA objectives for water quality and beneficial use protection;

(ii) A Dredge Spoil Disposal Management Plan to include disposal of dewatering fluids and dredge spoil and construction of two offshore islands to create replacement habitat for water birds;

(iii) A Water and Sediment Quality Monitoring Plan; and

(iv) A maintenance and management agreement for the marina and entrance channel.

9) WATER SUPPLY MANAGEMENT

Prior to construction, a Water Supply Management and Monitoring Plan shall be prepared in consultation with the EPA on advice from the WRC. The Plan will address:

- (i) groundwater monitoring, data analysis and reporting;
- (ii) ongoing aquifer modelling to ensure that the growth and ultimate population of the development area is sustainable in terms of available water supply; and
- (iii) the identification of appropriate contingency options for water supply.

10) LANDSCAPE MANAGEMENT

Prior to construction, a Landscape Plan shall be prepared for each stage of the development, in consultation with the EPA. The Plan will address:

- (i) Methods proposed to supplement existing vegetation and increase fauna habitat, particularly in areas of degraded remnant vegetation, in accordance with landscaping requirements, habitat replacement priorities and Planting Guidelines published by the Pinjarra Community Catchment Centre; and
- (ii) Planting of Tuart trees in strategic locations (focussing on the golf course) to enhance the site's landscape and

increase the area of potential habitat for the Peregrine Falcon.

11) WATERBIRD MONITORING

Prior to construction, a Waterbird Monitoring Plan shall be prepared for those areas adjacent to important waterbird habitat in consultation with the EPA on advice from CALM and PIMA.

12) CONSTRUCTION MANAGEMENT

Prior to construction, a Construction Management Plan shall be prepared for each stage in consultation with the EPA on advice from the Shire of Murray. The Plan will address:

- (i) The minimisation of clearing and vegetation disturbance;
- (ii) The protection of foreshore buffers;
- (iii) The control and monitoring of dust noise and smoke; and
- (iv) The incorporation of environmental protection specifications in all construction-related contracts.

13) ROBERT BAY WETLANDS MANAGEMENT

Prior to construction of the Robert Bay Wetland, a Wetland Management Plan shall be prepared in consultation with the EPA on advice from PIMA, the Shire of

Murray and the Water Corporation. The Plan will address:

- (i) maintenance of existing drainage functions of the drain;
- (ii) minimisation of mosquito breeding areas;
- (iii) maximisation of ecological and habitat functions of the wetland; and
- (iv) ongoing monitoring of wetland water quality and ecological functions.